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## In this issue



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## AIMS AND SCOPE OF *INDUSTRY AND DEVELOPMENT*

The journal *Industry and Development* is published at least twice a year in English, French and Spanish, as an integral part of the work programme of the International Centre for Industrial Studies (ICIS) of UNIDO. Selection of articles and book reviews published in *Industry and Development* is made by a Supervisory Panel composed of the following ICIS staff members: J. Cody, A. de Faria, A. Feraldis, S. Nanjundan and V. Richardson. Substantive responsibility for this issue of the journal rests with A. Feraldis.

*Industry and Development* attempts to provide a communication link between practitioners and theorists working on economic and related aspects of the process of industrialization. The focus of the journal is on applied analytical research in areas emphasized in the Lima Declaration and Plan of Action on Industrial Development and Co-operation (see UNIDO, PI/38), such as international industrial co-operation and consultations; national, sectoral and project planning and policy formulation; economic aspects of technology choice, transfer and development; the role of the transnational corporations; rural and small-scale industrialization; and income distribution and employment.

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# *Foreword*

*I welcome this new journal, designed to range over the whole field of industry and development, as a means of providing information through which progress in the implementation of the recommendations of the Lima Conference can be assessed, trends analysed and the continuous activities of UNIDO adequately reflected.*

*UNIDO has had to take account of several significant events and decisions since it began operating in Vienna. Strategies from year to year have been decided by the Industrial Development Board in order to fulfil the mandate given to the organization by the General Assembly and by the General Conferences of UNIDO. After the Lima Conference, the UNIDO secretariat, which had long been concerned mainly with the implementation of technical assistance projects, is now expected to participate actively in providing general guidance for the years to come.*

*Events that started early in the 1970s and developed into major crises affecting all nations shaped the course of events at Lima. In April/May 1974, the United Nations drew up a Declaration and Programme of Action on the Establishment of a New International Economic Order. One year later, in March 1975, at Lima, the nations attending the Second General Conference of UNIDO concentrated on giving effect to that Declaration in the field of industry.*

*One of the major achievements of the Lima Conference was the setting up of the target for developing countries to bring their share of world industrial production up to 25 per cent by 2000. The programme designed to reach that target focused the attention of UNIDO on the overall industrial development of the world. Consequently, the Conference decided that UNIDO must assume the leadership in the field of industry, be capable of mobilizing world opinion and co-operative efforts, and have greater resources and authority. In order to enable it to play such a role, the Conference also recommended that UNIDO should be converted into a specialized agency.*

*Pending such a conversion, our studies and technical assistance operations should already reflect the momentum built up and directions given at Lima. I am convinced that these pages will continuously help us to see more clearly how far the initial steps towards our objectives have taken us, not only in terms of the efforts of our staff, but more importantly, in terms of intensified co-operation between nations.*

Industry and Development *now takes its place in the common effort, and I wish it every success and long life.*

Abd-El Rahman Khane
Executive Director, UNIDO

# Preface

The Lima Declaration and Plan of Action on Industrial Development and Co-operation adopted by the Second General Conference of UNIDO underlines the importance of promoting co-operation between developing countries as well as between developing and developed countries.

Regional industrial co-operation consists of setting up and developing industries on an inter-country basis with a view to achieving the economies of scale that are possible when small national markets are integrated. The establishment of this co-operation may be subject to conditions such as the following:

*(a)* The countries involved must be at similar stages of development;

*(b)* Raw materials must be available;

*(c)* Production of the commodity to be manufactured must be profitable within the region;

*(d)* The cost of transportation of the commodity and its inputs must be low relative to the value added in production;

*(e)* The industries to be established should not impose a burden on other industries by adversely influencing costs or drawing resources away from them.

As a result of growing awareness among developing countries of the need for closer co-operation in their economic relationships, substantial efforts are being made to study the effects of increased co-operation on industrialization and development, and to define planning techniques and policy instruments that will enable the developing countries to take collective action within a comprehensive, coherent and agreed framework.

The form and suitability of such techniques will naturally depend on the nature and extent of the co-operation that the individual countries consider to be practicable and desirable and on considerations of their administrative institutions.

The techniques developed in the papers by Kuyvenhoven and Mennes, and by Franco are based on the "package" approach. This approach may be defined as a method of regional co-operation whereby the member countries of the regional scheme agree to allocate to each other specified industrial activities and grant trade liberalization or other incentives in respect of the manufactured products to be imported. The package approach has the advantage over the single industry approach that the co-operating countries are offered the possibility of getting a fair share in the distribution of projects and their benefits. However, it should be kept in mind that to achieve a continuously equitable distribution over relatively short periods is almost impossible. Consequently, the objective should be to distribute and phase projects in such a way that over a long period all the countries concerned benefit from co-operation—with the proviso, however, that certain techno-economic and political conditions must be met.

A co-operative project requires that the analysis determines in detail the origin of every input, the destination of the product, and the likelihood of successful co-operation in terms of objective and subjective relations between participating countries.

The effects of the projects on the national economies are of primary importance, but the benefits that may ultimately be derived from a given project depend on conditions in the host country. Different countries have different endowments and are faced with different problems; so there is no such thing as a single satisfactory criterion applicable to all countries regarding the recommendation of specific projects. In some countries a shortage of foreign exchange may constitute the main obstacle to industrialization; in others value added and the exploitation of existing local raw materials may be of greater importance. Some regional projects serving combined national markets may, after a number of years, become national ones, if their local markets grow sufficiently to absorb the capacities originally established. This in no way refutes the concept of co-operation, since the originally regional markets will have served their initial purpose of triggering development. In such cases, relevant alternatives should be introduced by phasing in similar projects that absorb the markets of the respective reduced subregions defined by the products in question. Consequently, while the objective will always tend to be an autarkic economy, the means of attaining it will be collective self-reliance.

Increased co-operation is also needed in the assessment of capital inflows to developing countries. As a rule, companies aim to maximize profits under the most favourable terms, while the objectives of host Governments are export earnings, increased employment and the like. The negotiations required as a consequence cover a multitude of such matters as cost and benefits, profit remissions, tax treatment, export earnings and tariff protection.

The paper by Lal examines the special case of foreign investment and presents project appraisal methods that provide a framework for improving the analysis of the negotiation matters mentioned above.

It is hoped that, by improving the analytical techniques of project evaluation when foreign capital inflows are involved, negotiations will be simplified, since these techniques will clearly show that projects should be so allocated that every country secures benefits, subject to a combination of self-imposed restrictions. The best distribution of projects, however, is a question of negotiation and depends solely on the willingness of the countries constituting the region to co-operate. The primary concern in all negotiations should not be to gain an exceptional advantage that profits only one country, but to obtain a mutually satisfactory assignment of projects that allows benefits to be distributed equitably among all those concerned.

# Projects for regional co-operation: identification, selection, evaluation and location

*Arie Kuyvenhoven and L. B. M. Mennes**

## *Introduction*

The economic integration of countries may assume many forms (a free trade area, a customs union etc.). Particularly for developing countries, such integration schemes are hard to realize at present, for economic and political reasons. A project co-operation scheme may be a useful and advantageous substitute for more complete integration schemes. Project co-operation consists of an agreement between two or more countries to allocate among themselves a certain number of industries whose products will have free access to the markets of those countries. To be more specific: project co-operation consists of a partial customs-union-cum-investment-plan. In such a scheme the participating countries agree on the reciprocal abolition of tariffs or other trade impediments on a number of specific commodities. In this way a partial customs union is established for a limited number of products. In addition, the participating countries mutually agree on the investment programmes in the sectors corresponding to the commodities for which the partial customs union is established.

Such a project approach to regional co-operation is the subject of the present paper. For this reason, special attention will be paid to the identification, selection, evaluation and location of projects specifically meant for co-operation purposes. The location of regional projects in the prospective member countries will be analysed along the lines of the so-called package approach. With this approach, an equitable distribution of the benefits of economic co-operation among the member countries can usually be obtained—a considerable advantage over other regional co-operation schemes.

The present paper has profited considerably from two recent empirical studies on project co-operation in Asia: the study on "Economic co-operation among Member Countries of the Association of South-East Asian Nations" [1], and, in particular, the *Asian Industrial Survey for Regional Co-operation* [2]. A number of problems relating to regional co-operation are discussed in these two studies, and will therefore not be repeated in this paper (for example, general issues in regional co-operation, different schemes of co-operation, implementation, political factors). The present paper concentrates on those issues that have received less attention in the aforementioned two studies (identification of projects, methodology for evaluating and selecting co-operation projects, method of arriving at alternative packages of projects). In addition, the present paper confines itself to industrial projects.

The organization of the paper is as follows. Sections I and II deal with project identification for national planning and for regional co-operation purposes respectively. In many respects, the identification of projects for co-operation purposes corresponds with the general procedure of identifying projects at the national level. It therefore seems appropriate to discuss the more general factors in

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project identification first and to confine the discussion of identifying projects for regional co-operation purposes to factors directly related to regional co-operation. Section III deals with the preparation of pre-feasibility studies and the selection of projects for co-operation purposes. In anticipation of the methodology for the evaluation of co-operation projects (sections IV and V), simple selection criteria are derived and a number of special cases considered.

The methodology for the evaluation of regional co-operation projects is discussed extensively in sections IV and V, which also examine how each of the elements that are relevant in a social cost-benefit analysis of a project for regional co-operation purposes may differ from the elements of an identical project that does not assume regional co-operation. The possible differences in benefit between the two types of project are dealt with in section IV, essentially by an examination of possible differences in the accounting prices of the outputs. In section V, a similar comparative analysis is made of costs: possible differences in the accounting prices of the inputs are examined.

Section VI deals with various possible ways of arranging projects between member countries when the package approach is used. An efficient, least-cost package is established first, on the basis of which more equitable assignments of projects to countries are constructed. Special attention is given to the problem of how to arrive at an optimum package in a systematic way using mathematical programming techniques.

The timing of projects, the treatment of transportation costs, and a possible simplification by using distributional weights are discussed in the final section.

## I. Project identification for national planning

In the vast body of literature on project evaluation and cost-benefit analysis that has appeared in recent years, remarkably little attention is paid to ways of identifying and selecting projects for which it would be worth making pre-feasibility studies and, eventually, full feasibility studies that would cover the technical, economic, commercial, financial, managerial and organizational aspects of the project. Two well-known manuals, the second volume of the OECD *Manual of Industrial Project Analysis in Developing Countries* [3] or the revised version [4], and the UNIDO *Guidelines for Project Evaluation* [5], do not touch on this subject. A recent UNIDO paper on the preparation and implementation of industrial projects [6] mentions identification as a stage in the preparation of projects without any further elaboration. More examples from recent literature could be added.

Although they do not fully redress the balance, some of the publications that reflect the work and experience of the World Bank (King [7], Baum [8] and Vietorisz' UNIDO study [9] include a clear treatment of the identification and selection stage of project preparation. According to King ([7], p. 4):

> "In theory, the identification, selection and preparation of projects should follow from an overall national development plan, which will have identified the priority sectors and production targets, thereby providing the criteria for the selection of projects. Although projects are sometimes derived from the plan in this way, in practice they are usually selected to meet identified, specific needs or to take advantage of special opportunities–the presence of natural resources or some other special circumstances permitting production of a commodity at a relatively low cost, or the existence of domestic demand, either unsatisfied as is frequently the case with electric power and transport, or satisfied through imports with costs sufficiently high to permit economic domestic production."

Similarly, Baum ([8], p. 4) argues that

"There are essentially three tests involved in the identification of a project. The first is whether the sector of the economy into which the project falls, and the project itself, are of high priority for development and are so recognized in the Government's development plan. The second is whether, on *prima facie* grounds, the project seems to be feasible; that is, whether a technical solution to the problem to which the project is addressed can be found at a cost commensurate with the benefits expected. And the third test is whether the Government is willing to support the project by financial and other means."

There are many ways in which projects are identified in practice; Baum ([8], pp. 4-5) mentions the following:

*(a)* The extension of existing projects, or the establishment of new projects directly related (through backward or forward linkage) to an existing one;

*(b)* Special missions to look into sectors in which no previous detailed information has been collected (preliminary reconnaissance surveys);

*(c)* As side products of economic missions of the World Bank to review major sectors of the economy in order to establish development priorities and to identify projects;

*(d)* Submission of projects by private business organizations.

The above examples indicate that project identification is not likely to be simply a matter of applying systematic and straightforward methods. In practice, projects will usually be identified by several approaches, the most important of which will be discussed below. It is possible that the absence of systematic methods to identify projects may account to a large extent for the almost total neglect of the matter in the more theoretical literature on project analysis.

The *sectoral development strategy* in a country's national development plan is often mentioned as a first method of identifying projects. Provided the sectoral priorities are not formulated in too general a way, priority sectors might give a useful indication of where to look for new projects. An example of such priorities can be found in the *Guidelines for the Third National Development Plan 1975-1980* [10] of Nigeria, in which the following strategy for the manufacturing sub-sectors is outlined:

*(a)* Import substitution industrialization, specified as:

(i) The remaining production potential in the group of traditional light consumer goods;

(ii) Quality improvements in those areas where substantial progress in import substitution has been made in recent years;

(iii) The search for domestic substitutes for imported raw materials;

(iv) The production of intermediate goods through a process of backward integration stimulated by appropriate fiscal policies;

(v) The production of capital equipment;

(vi) The production of non-traditional and relatively sophisticated types of consumer goods and miscellaneous hardware items;

*(b)* Non-traditional export industries such as petrochemicals and a variety of fabricated metal products, machinery and equipment;

*(c)* Agro-based industries and industries that produce inputs for the agricultural sector;

*(d)* Intermediate and heavy industries (an iron and steel project and some other major federal projects);

*(e)* Small-scale industries.

Some of these priority sectors are admittedly still too general to be of much help for project identification. A fair number, however, can be considered sufficiently precise to suggest project ideas. For example, a team of consultants was able to prepare project summaries of 134 agro-allied projects and 95 building-materials projects that had been identified and subsequently presented to the consultants, in different stages of preparation, by the various state ministries in the Federation.

At first sight, the availability of *sectoral production targets* in a national development plan would seem to be an improvement over the qualitative indication of priority sectors. Moreover, in the special case in which sectoral production volumes have been obtained by the use of input-output techniques, the relative attractiveness of sectors in terms of national objectives and scarce resources can often be established without much additional work. If sectors are sufficiently disaggregated and comprise a fairly narrow range of comparable products or production processes, such information at the sectoral level would greatly facilitate the identification of new projects. The number of new projects to be identified for each sector should roughly correspond to the planned production targets, provided the attractiveness of marginal projects does not vary too much between sectors. (In theory, the differences in attractiveness of marginal projects should serve as a check on the planned production increases and facilitate, in turn, the selection of projects.)

In empirical applications, however, it has frequently been observed that at the present level of disaggregation (30-50 sectors), the variety of economic characteristics of different products within the same sector is greater than between sectors themselves. This implies that specific commodity constraints or clear opportunities for product specialization may be easily overlooked at the sectoral level of aggregation. In addition, the statistical information on which multi-sector studies are based is usually several years old. The commodity composition of sectors might have changed considerably in the meantime; so the picture presented could be somewhat inaccurate and out of date – an important disadvantage if the results are to be used for project identification.

The usefulness for project identification of information on sectoral production targets in a national development plan depends therefore crucially on the level of disaggregation and the use of very recent data. The fifth five-year plan (1974-1979) of India is an example of a plan that contains sufficient sectoral detail, based on recent and carefully updated information, to facilitate project identification. Its sectoral targets are based on input-output consistency tests involving 66 sectors—of which 50 are manufacturing sub-sectors—and, in the case of manufacturing, include physical production targets for 63 manufacturing sub-sectors, comprising more than 110 product groups.

Another important approach for identifying projects lies at the project level itself. Products serve specific needs, and when such needs can be observed a project may be identified. This is most evident for *products in short supply* or *products imported from abroad at high cost.* As almost all industrial products can be traded across national borders, import statistics are often used as a means of identifying such potential projects. If domestic production is known, an estimate of the present domestic demand can easily be obtained and may be used as a first check on the feasibility of a potential import-substitution project. It should be emphasized, however, that a mechanical application of import statistics as a guideline for project identification can lead (and in many countries has indeed led) to substantial

inefficiencies in resource allocation, if no attention is paid to a country's comparative advantages. When the principal aim of a project identified is production for export, considerations of comparative advantage and competitiveness are usually taken into account from the outset; in terms of resource allocation, the case of import substitution is hardly different.

The next method of project identification is partly related to the previous one in that it emphasizes the special opportunities for the production of commodities based on available and potential natural resources and on the country's factor endowments. Because of comparative cost advantages, such products can generally be exported or used as substitutes for previously imported raw materials and intermediate goods. It should be realized, however, that in many countries the present knowledge of potential natural resources is limited; so the identification of projects based on such resources will usually have to be preceded by extensive geological and aerial surveys to determine what kind, amount and quality of resources are actually available.

Finally, as Vietorisz has pointed out, special attention has to be paid to potentially attractive projects that are likely to be overlooked because they appear unusual or differ substantially from existing operations. For example, if a country's chemical sector is

> "characterized by small chemical firms engaged in mixing and packaging-type of operations, a project involving a large petrochemical complex is unlikely to be forthcoming from the private sector; likewise, where simple basic processes dominate, a sophisticated computer-controlled gas reaction is less likely to be spontaneously considered than more conventional processes" ([9], p. 16).

Vietorisz mentions the following reasons why potentially attractive projects may not be properly identified:

> "(i) Unusually large financial requirements compared with customary firm size;
> "(ii) Unusually advanced technology compared with prevailing standards;
> "(iii) Integration between processes not customarily so integrated;
> "(iv) Separation of subprocesses not customarily so separated; and
> "(v) Technological requirements diverging sharply from those customary in the more advanced countries" ([9], p. 16).

The application of the various methods of project identification mentioned will normally produce a wide variety of potential projects or project ideas, the main virtue of which is their comprehensiveness. However, to eliminate at the earliest possible stage completely unfeasible projects, their overall feasibility should be assessed before any other preparatory work is done. Understandably, at this stage the selection of projects can be based only on global criteria, such as:

*(a)* Are there any serious doubts about the general technical features, the site and the location of the project?

*(b)* Are essential raw materials and other major inputs available in sufficient quantities and required quality?

*(c)* Is the size of the potential market sufficient to ensure profitable production at a reasonable scale of operation?

*(d)* If the project requires foreign technical partners or substantial expatriate technical and managerial staff, are such experts available and acceptable to the Government?

*(e)* Are, at first sight, expected revenues (based on the present and future markets) in line with anticipated costs (major inputs, capital investment, labour) as measured by a preliminary calculation of the internal rate of return on capital?

Projects that fail to meet these criteria should be either rejected, or postponed if specific constraints are likely to disappear or be resolved in the near future. In the special case in which a project meets criteria *(a)*, *(b)* and *(d)*, but not criterion *(c)*, and hence criterion *(e)*, because of the limited size of the national potential market, a project has been identified that might operate efficiently and promise a reasonable rate of return in a wider market created by regional economic co-operation. A similar situation arises if the prospective partners want to produce for their domestic markets and for export, but all for the same export markets. Projects of this type are discussed in the following section.

## II. Project identification for regional co-operation

In principle, the procedure described at the end of the previous section premits the most comprehensive identification of projects for regional co-operation purposes. If all countries willing to participate in a regional co-operation scheme were to adhere to this procedure, it would be possible to identify a number of projects that are not profitable when producing for a national market only, but that might be profitable in the combined markets of the prospective partners. All that remains to be done is to eliminate projects for which even the enlarged regional market is still too limited and for which no direct prospects for export to third countries exist. The *Guidelines for the Third National Development Plan* of Nigeria [10] explicitly request ministries and consultants to submit industrial projects that go beyond home market potentials. According to the *Guidelines,* "Experience has shown that projects which were conceived with only the Nigerian market in view have failed to satisfy even this market" ([10], p. 30).

In practice, however, the preparation of project co-operation schemes is not always so closely related to project identification at the national level. For this reason, the preparation of project co-operation arrangements often requires separate identification of a number of projects for which the national market is too limited to ensure a reasonable rate of return, so that producing for a larger regional market becomes a condition for attaining normal profitability. Almost all projects that belong to this category appear to be characterized by important economies of scale. The cost saving that can be achieved by producing on a larger scale is usually the principal reason why new projects become profitable when they produce for a larger regional market instead of a national one. If the co-operation arrangement also extends to existing plants, a number of them can be expected to produce at lower average cost because the regional market may allow higher capacity utilization.

Indivisible costs are the main source of economies of scale: many cost elements are, over a certain range, more or less independent of the scale of output. Examples are: items of capital equipment, senior management personnel, initial development and design costs and inventing new techniques of production. With increasing scale, such indivisible cost items can be spread over a larger output and the average cost per unit reduced.

Two special cases of indivisible costs are often mentioned separately as sources of economies of scale: economies of increased dimensions and economies of specialization. Economies of increased dimensions refer to those types of equipment for which "initial and operating costs increase less rapidly than capacity. A typical

example of such economies occurs in the construction of tanks, pressure vessels and road and sea tankers which are commonly used in the chemical and oil industries" ([11], p. 12). *Economies of specialization* occur when large-scale production allows horizontal and vertical specialization, that is, the reduction of the variety of products in an individual plant and the breaking up of formerly integrated production processes respectively. In both cases, production runs can be lengthened.

Of the other sources of economies of scale, the learning effect is probably the most relevant for developing countries. The continuous production of a good can lead not only to cost reductions but also to quality improvements (from technical experience in handling components or processes, or better organization of production). The same applies to the possible advantages of new production techniques; only after some experience has been acquired can such advantages be fully exploited.

Although the potential cost reductions through full exploitation of economies of scale appear substantial, empirical findings on their realization certainly caution against over-optimism. Reviewing recent empirical work on economies of scale at the plant, enterprise and industry level, Saunders concludes that:

> "(i) *Potential* economies of scale—both technical and organizational and of specialization exist at all levels, from the plant to the nation (or grouping of nations). Their extent varies greatly from industry to industry.
>
> "(ii) In fact, however, these potential economies have been realized only in part. They represent a resource for further economic growth in the long term which is still wide open for exploitation in many important sectors of industrial economies.
>
> "(iii) It is, moreover, clear that—like other elements in long-term economic growth such as technology, investment or education—economies of scale and specialization will not automatically open the door to greater economic efficiency. To enlarge the scale of operations of a productive organization, at any level, will raise its efficiency only if larger size is associated with, for example, the management skill, the technological adaptability, and the enterprise in marketing which are required to make a larger organization work successfully" ([12], p. 49).

The third conclusion is especially relevant to developing countries, because, with a generally less experienced labour force and management not so widely available, the minimum efficient size of a plant might be considerably smaller in a developing country than in a developed country. It is interesting that the second conclusion is also supported by the findings of the *Asian Industrial Survey for Regional Co-operation* ([2], p. 80): "For few industries would the largest possible co-operating group be large enough to secure most efficient production."

Apart from the question to what extent economies of scale can in fact be realized, it is important to take into account regional *transport and distribution costs* in order to avoid overestimating the advantages of regional co-operation. This is most evident where high transport costs result in the establishment of more plants well below the minimum efficient size. When both the number and the size of plants to be established in a regional market are not influenced by transport costs, only the regional transport costs that would not be incurred if there were no co-operation should be subtracted from the cost saving from economies of scale.

Transport and distribution costs are also an important factor in the location of regional co-operation projects, and this in turn affects the distribution of the benefits of co-operation among the prospective members. When transport costs on either raw materials or output are high, the location of the project is, to a large extent,

**Table 1. Type, size, transport and electricity input characteristics of selected industrial activities with economies of scale**

| ISIC | Sector or major activity | Product or product group | Type of industry | Remarks | Transport of raw materials and product: Total | Transport of raw materials and product: Highest share | Electricity requirements |
|---|---|---|---|---|---|---|---|
| 3117 | Bakery products | | P | Small m.e.s. | Low | Equal | Less important |
| 3133 | Beer brewing | | P | Small m.e.s. | Important | Product | Less important |
| 3211 | Cotton textiles | | T | Economies of scale limited, small m.e.s. | Very low | Materials | Important |
| 3213 | Hosiery | | T | | Very low | Materials | Important |
| 3240 | Footwear | | T | | Very low | Materials | Important |
| 3411 | Pulp and paper | Newsprint | P | | Important | Materials | Important |
| | | Printing and writing paper | P | | | | |
| 3420 | Printing and publishing | Newspapers | O | | Low | Equal | Less important |
| | | Books | O | | | | |
| 3511, 3540 | Basic industrial chemicals | Soda ash, caustic soda and chlorine | P | | Important | Materials | Important |
| | | Petrochemicals | P | | Low | Materials | Important |
| 3512 | Fertilizers | Nitrogenous fertilizer | P | | Important | Product | Less important |
| | | Phosphate fertilizer | P | | Important | Materials | Important |
| 3513 | Man-made fibres | | O | | | | |
| 3523 | Soap and detergents | | P | | | | |
| 3529 | Other chemical products | Carbon black | P | | Low | Equal | Important |
| 3530 | Petroleum refineries | | P | | High | Equal | Less important |
| 3551 | Tyres and tubes | | P | | | | |
| 3560 | Plastic products | | O | | Low | Equal | Important |
| 3620 | Glass and glass products | Flat glass | P | | Important | Materials | Less important |
| 3691 | Structural clay products | Bricks | P | Small m.e.s. | Very high | Materials | Less important |
| 3692 | Cement | | P | | Very high | Materials | Less important |
| 3710 | Iron and steel | Steel billets | P | | Important | Materials | Important |
| | | Iron castings | O | | Low | Materials | Important |
| 3720 | Non-ferrous metals | Ferro-alloys | P | | Important | Materials | Important |
| 382 | Non-electrical machinery | Internal combustion engines | E | | | | |
| | | Typewriters | E | | | | |
| | | Compressors | E | | Low | Equal | Less important |

| | | | | | |
|---|---|---|---|---|---|
| | | Electronic capital goods | E | | |
| | | Aluminium cables | E | | |
| 384 | Transport equipment | Motor vehicles | E | Small m.e.s., economies of scale limited | Less important |
| | | Bicycles | E | | |
| | | Aircraft | E | | |

*Sources: Asian Industrial Survey* [2], ASEAN survey [1], Pratten [11] and UNIDO [13].

*Notes:* P = processing industry, E = engineering industry, T = textile and clothing industry, O = other industries; m.e.s. = minimum efficient scale (scale of output at which average costs cease to fall; as it is difficult to ascertain such a point, Pratten has used the following definition: "Minimum scale above which any possible subsequent doubling in scale would reduce total average unit costs by less than 5% and above which any possible subsequent doubling in scale would reduce value added per unit by less than 10%" ([11], p. 26).

determined by transport cost considerations. When transport costs on the product dominate total transport costs, the spatial dispersion of the market becomes important and may cause the concentration of a number of projects in the largest and/or most developed member country—a problem encountered in many co-operation schemes.

The *process of identifying projects for regional co-operation purposes* need not differ much from that of identifying projects at the national level, discussed in the previous section, except for the special attention given to possible economies of scale. At the sectoral level, the outcome of various cross-section analyses shows that important economies of scale in the manufacturing sector occur mainly in the textile, pulp and paper, printing, chemical, petrochemical and rubber products, building materials, basic metals and metal product industries. Within these manufacturing sub-sectors, a large number of projects with economies of scale have been studied in the literature using engineering data or statistical observations of existing plants. A number of such industries and projects are summarized in table 1. The table is based mainly on Pratten [11], supplemented by data on transport and electricity calculated from UNIDO [13], with additional projects taken from two recent studies on project co-operation, the *Asian Industrial Survey* [2] and the ASEAN study [1].

Following Pratten ([11], p. 265), four different types of industry are distinguished: processing industries, engineering industries, textile and clothing industries and other industries. Industries where plants have a relatively small minimum efficient scale or where possible gains from economies of scale are limited are marked accordingly. Projects in such sectors are probably of limited value for regional co-operation purposes where economies of scale should be pronounced and the size of the national market is a real constraint on the project's profitability. Transport costs are classified as "low" or "very low", to indicate that the industry can be considered more or less independent of location, or as "important", "high" and "very high", to emphasize that transport costs cannot be neglected. Additional information on the share of total transport costs attributable to raw materials and to the product is presented to illustrate one of the project's locational characteristics. For similar reasons, information is given on one of the project's inputs, electricity, to facilitate judgement on the overall feasibility of a project for a specific location.

Table 1 allows the following *classification of projects with economies of scale* that could serve as regional co-operation projects:

(a) *Engineering industries.* Transport costs are generally low and are not dominated by either materials or final product. Electricity requirements are less important. Among the group of "other industries", the printing and publishing sector has the same characteristics as the engineering industries;

(b) *Processing industries.* Pulp and paper, chemicals (including the remaining part of the group of other industries), and basic metals have several characteristics in common. On the whole, transport costs can no longer be neglected (exceptions are plastics and carbon black). In many cases the share of raw materials dominates, and a fair number of activities have important electricity requirements. For building materials (mainly cement), transport costs are high (materials dominate), but electricity requirements are less important than for some of the other process industries. Bakery products and beer are included under processing industries;

(c) *Textile and clothing industries.* These are of more limited significance for co-operation purposes.

Finally, the overall feasibility of any potential co-operation project should be assessed preliminarily along the lines suggested in the previous section. With regard to

the size of the market, no projects should be selected that can operate efficiently in some of the national markets, because such projects do not offer a sufficient case for regional co-operation. Similarly, there is no reason to consider projects that require a minimum efficient scale far beyond the present regional market and can therefore not be expected to become profitable in the near future. When regional economic co-operation is to be brought about by means of industrial package arrangements, it is advisable to have a fairly large number of projects in a variety of types of industry, especially those largely independent of location, because equity considerations will generally require the design of a number of alternative packages in order to create sufficient scope for negotiations between the member countries.

## III. Project preparation and selection

Once a number of suitable projects for regional co-operation purposes have been identified, the projects pass through several stages of preparation, the first of which is the *preparation of pre-feasibility studies.* During this stage more detailed data on the projects are compiled to permit a more precise appraisal than the one based on the general criteria used at the identification stage. After the private and social profitability of the potential projects has been established for different locations, projects are selected and provisionally allocated to the participating countries in the regional co-operation scheme on the basis of the projects' attractiveness. The exact methodology for the economic evaluation of the regional co-operation projects and their selection for inclusion in a regional co-operation arrangement are discussed more extensively in the following two sections. In this section, the proposed methodology will be described only briefly in order to illustrate its use for project selection.

The difference between the identification and preselection stage and the preparation and evaluation of pre-feasibility studies is clearly described by Vietorisz [9]. In his view, the two stages can be summarized by saying that:

> "in the preselection stage, a decision is taken with regard to allocating scarce resources to be used in (pre-)feasibility studies, while in the (pre-)feasibility studies themselves, the allocation concerns the conventional resources: primary factors, basic commodities and so on. The decisions relating to the selection between competing projects are taken at this stage or, in some cases, they may be deferred until detailed project engineering for a few selected projects has been completed. Since project engineering is far more cumbersome, time-consuming and expensive than a (pre-)feasibility study, it is essential that a great deal of narrowing of the range of choice be undertaken at the (pre-)feasibility study level. It is equally essential that an adequate range of well-defined alternatives should be available at the (pre-)feasibility study stage; otherwise there will be nothing to select from, and decision making will inadvertently be pushed back into the stage of preselection" ([9], p. 17).

Apart from a general technical analysis of projects, pre-feasibility studies should permit a fairly detailed economic analysis. The pre-feasibility studies should therefore provide sufficient information to examine:

*(a)* The present and future size of domestic and regional markets;

*(b)* The availability and quality of raw materials and other essential intermediate inputs;

*(c)* The principal inputs (both on current and capital account, including maintenance and replacement expenditures) and outputs during the construction process;

*(d)* The number of plants, their size, location and timing;

*(e)* In connection with *(d)*, a number of locational characteristics, such as transport costs of major inputs and outputs, and siting requirements (deep water, storage facilities);

*(f)* The private and social profitability for different locations when projects (i) can produce for the regional market (co-operation) and (ii) can serve only a national market (non co-operation).

It is often argued that, where there are economies of scale, the determination of the optimum scale, number, location and timing of projects might become so complicated that decisions on project selection should be based on *sector-wide analysis.* Unfortunately, the planning techniques needed for such an analysis (mixed-integer programming) are not yet sufficiently developed to permit their application on a routine basis. The main difficulty with this type of problem arises from the very large number of possible solutions that have to be examined, and for which no simple algorithm is yet available. However, if the number of possible combinations can be kept within reasonable limits, the application of such techniques can be useful, although the criterion for the selection of projects is necessarily a simple one (usually cost minimization) compared with the criteria used in conventional project evaluation. A forthcoming study by the World Bank [14] includes a more extensive discussion on these and related topics.

For the information of the prospective partners in a co-operation agreement, it is often useful to present the most important *effects of the various co-operation projects* separately. Such effects usually concern: *(a)* the estimated investment cost, *(b)* the value added in production, *(c)* the employment generated and *(d)* the possible foreign-exchange saving. Additional measures are, of course, conceivable; the ASEAN study [1] mentions *(e)* the extent of local inputs into production, *(f)* the foreign exchange component of the capital cost, *(g)* the intra-ASEAN trade flows generated by a project, *(h)* any special infrastructure cost and *(i)* the estimated concessions by other ASEAN countries necessary to make a specific project viable. When both the number of co-operation projects and the number of member countries to be considered are large, it is advisable to confine the information on the effects of the various projects to a few measures only.

To determine the social profitability of the potential co-operation projects, a *methodology for the appraisal of projects* has been chosen that is largely based on the concepts and principles used by Little and Mirrlees in their OECD *Manual* [3] and its successor volume [4]. Using the terminology of the successor volume, the methodology can be briefly summarized as follows.

For each year of a project's life, the value of its uncommitted social income is calculated in terms of convertible foreign currency. To arrive at this value, the inputs of the project are subtracted from its output, valued at the appropriate accounting prices. Generally, these accounting prices are equal to the opportunity cost expressed in foreign exchange converted at the official exchange rate. For traded goods, the accounting price is usually the border price (c.i.f. for imported goods, f.o.b. for exported goods); if the border price is influenced by the amount bought or sold, marginal import cost or export revenue are the appropriate prices. Accounting prices for non-traded goods and services are generally equal to their cost of production,

measured at accounting prices. Because most non-traded goods require inputs of other non-traded goods, the accounting prices of the latter will usually have to be determined simultaneously. The accounting price of labour (of various categories) is estimated on the basis of its marginal productivity and the effects of additional consumption generated by new employment. Because part of the additional consumption refers to non-traded goods, the shadow wage rate (SWR) and the accounting prices for non-traded goods will have to be estimated together.

Next, the social income of a project is corrected for any unavoidable commitments to consumption of a particular income group. The reason for this correction is that in many countries the distribution of income is only partly controlled by the Government, for political and administrative reasons. Under these circumstances, a high commitment to consumption of a particular income group can be only partly reduced by appropriate taxes and charges. The remaining disadvantages of such consumption commitments are therefore subtracted from the social income of the project, and this gives the project's social profit—the ultimate measure of the project's value to the society in any given year.

Once the net social profit for each year of a project's life has been estimated, the social internal rate of return (IRR)—defined as the rate of interest at which the sum of the discounted present value of each year's net social profit becomes zero)—can be calculated. When the same project can be located in different countries, the country showing the highest IRR will be called the efficient location of the project. In addition, it will be assumed that for each of the countries participating in the co-operation agreement, the accounting rate of interest (ARI)—the interest rate for which the number of projects undertaken without co-operation just exhausts the national investment resources—can be estimated. The ARI for the whole region will be defined as the interest rate for which the total number of projects undertaken in all participating member countries exhausts the combined national investment funds in a situation of regional economic integration. In other words, the ARI for the region is the IRR of the marginal project where there is complete integration. The ARI for the region will be estimated as the average of the ARIs of the participating countries, weighted with the shares of the countries' national investment resources in the total regional investment (average ARI). Since the inclusion of regional projects increases the IRR of the marginal project for the region as a whole, this rule probably leads to a small underestimate of the ARI for the region.

On the basis of the proposed methodology, *two criteria for the selection of projects* for regional co-operation purposes can now be established. The first criterion refers to the benefits of economic co-operation and requires that a co-operation project's social internal rate of return for its efficient location when serving the regional market ($IRR_{max}$) exceeds the internal rate of return of a comparable project in that country without co-operation:

1. $IRR_{max} >$ comparable IRR without co-operation

When the values of the social internal rates of return are almost the same, the benefits of regional economic co-operation are apparently limited, and the project should be rejected as unsuitable for co-operation purposes (provided the two projects considered are of comparable size; the case of projects of different sizes is dealt with below).

The second criterion concerns the social profitability of the project, and requires that a project generates net benefits both to the whole region and to the country that is to undertake the project. The project's social internal rate of return for its efficient

location should therefore exceed the average accounting rate of interest for the region, as well as the accounting rate of interest of the country in which it is to be located:

2a. $IRR_{max} >$ average ARI

2b. $IRR_{max} > ARI_{\text{country of efficient location}}$

If the potential co-operation project is to be undertaken by a private investor, a third criterion should be added: that the private profitability of the project is sufficiently high to attract private interests. In the rest of this paper it will be assumed that this condition is usually met.

In applying criteria 1, 2a and 2b to potential co-operation projects, the following cases are likely to be of interest:

(a) *A project satisfies criteria 1, 2a and 2b.* The project should be accepted for co-operation purposes, because it generates higher benefits when serving a larger market. The benefits are advantageous to the whole regional group as well as to the country in which the project is to be located;

(b) *A project fails to meet criterion 1.* The project should be rejected for co-operation purposes, but accepted for those countries in which the project's IRR is greater than their ARI;

(c) *A project satisfies criteria 1 and 2b only.* The project should be rejected for co-operation purposes because it fails to generate sufficient benefits for the whole group. If export arrangements can be concluded, the project should be accepted for the country to which criterion 2b refers;

(d) *A project meets criteria 1 and 2a only.* (A special case that could occur when a member country with a relatively high ARI has outstanding locational advantages for a certain project.) Without co-operation, such a project will be rejected by the country itself because criterion 2b is not met. With co-operation, it is nevertheless conceivable that the country can be persuaded to undertake the project on condition that other member countries, for which the $IRR_{max}$ is greater than their ARI, assume full responsibility for the financing of the project. In these circumstances, the project can be conditionally accepted for co-operation purposes;

(e) *A project satisfies criterion 1 only.* The project should be rejected for co-operation within the proposed group of countries, because it probably requires a larger market than the combined markets of the proposed group can provide at the moment.

Criteria 1, 2a and 2b can be formulated in terms of *net present values* instead of internal rates of return. For this purpose, a co-operation project's present social value for its efficient location ($PSV_{max}$) is defined as the discounted present value of each year's net social profit of that project. When the PSV is calculated for the whole region, the average ARI is used as the discount rate; otherwise the respective ARIs of the member countries are used. Formulated in terms of present values, the selection criteria then read as follows:

1. $PSV_{max} >$ comparable PSV without co-operation,

2a. $PSV_{max} > 0$,

2b. $PSV_{\text{country of efficient location}} > 0$.

A slight complication might arise in the following situation, which cannot be excluded in theory:

$$IRR_{max} < \text{comparable IRR without co-operation} > ARI,$$

but

$$PSV_{max} > \text{comparable PSV without co-operation.}$$

If a judgement is based on the internal rates of return only, the project without co-operation would be selected. It is clear, however, that this would be an incorrect decision. What is involved here is a well-known shortcoming of the internal rate of return as a criterion for choosing between mutually exclusive projects (e.g. UNIDO *Guidelines* ([5], p. 21). The phenomenon will mainly occur, however, in situations where the amounts invested or the sizes of the projects are substantially different. In the cases with which the present paper is concerned, such a situation is unlikely to occur and will therefore not be taken into consideration.

The reader may wonder in what sense the proposed criteria for the selection of co-operation projects differ from *criteria applied in other recent studies*, particularly the *Asian Industrial Survey* [2] and the ASEAN study [1]. In the *Asian Industrial Survey* five criteria are mentioned ([2], pp. 51-52 and pp. 74-79):

*(a)* Present international competitiveness based on comparative advantages;

*(b)* Competitiveness in the long run, with protection during the project's initial phase of production (the "infant industry" criterion);

*(c)* Foreign exchange savings;

*(d)* External economies (not applied);

*(e)* Favourable private profitability.

Criterion *(b)* implies, in fact, a more dynamic interpretation of the concept of comparative advantage used in criterion *(a)*. With economic co-operation, the *Survey* states, projects that meet criteria *(b)*, *(c)* and *(d)* can be transformed into projects that meet the first criterion because of advantages of large-scale production.

In the ASEAN study the distinction between the effects of projects and criteria for their selection is not always clear, but it appears from the analysis of the results of the industrial studies that the following measures have been considered: *(a)* saving in capital cost, *(b)* saving in unit cost production, *(c)* saving of foreign exchange and *(d)* international competitiveness. The savings are the savings resulting from large-scale regional production over national projects of equal capacity; international competitiveness is usually measured by comparing, at the current exchange rate, the unit cost of production with the present world market price (c.i.f. basis) with a certain price differential considered necessary for successful competition taken into account, and transport costs. For a given rate of return and over a certain period of time, this comparison can be used to calculate tariff preferences, if necessary.

The proposed methodology for the evaluation of regional co-operation projects and the criteria for selection include most of the comparable criteria used in the other two co-operation studies. The valuation of inputs and outputs at accounting prices, as defined earlier, is meant to ensure that the criterion of international competitiveness shall be met. If, however, market and accounting prices for commodities and the market and shadow wage rate diverge considerably, corrective policy measures such as direct input and employment subsidies, exchange rate adjustment or tariff preferences will be desirable. The decision as to what kind of

corrective measure to apply is not necessarily linked to a specific project and can therefore be evaluated separately. Thus, in the special case that the first three measures are not applied, protection is justified indeed by the social profitability of the project.

The proposed methodology implies an entirely different approach to foreign exchange saving. Under optimum policies, both the ARI and the SWR are supposed to have been so determined that the number of projects accepted will not exceed the available investment funds. In aggregate terms, this means that the demand and supply for foreign exchange is balanced by an appropriate choice of the values for the ARI and SWR. In this approach, as a consequence, the mere scarcity of foreign exchange—which is often the reason given for calculating the otherwise misleading direct foreign exchange effect of a project—is no reason to attach any special value to whether a particular project uses or saves foreign exchange.

As to other criteria, savings in capital cost and savings in the unit cost of production are implied by criterion 1 ($IRR_{max} >$ comparable IRR without co-operation). Understandably, the criterion of private profitability should be treated as an additional criterion when the project is likely to be undertaken by a private investor.

When a co-operation project is privately unprofitable but passes the test of social profitability, special policy measures will be required to make the project sufficiently attractive from the point of view of the private investor. The aim of such corrective measures should be to remove the special causes of the difference between the project's private and social profitability rather than to improve the private profitability by more general means. If a major input into the project is over-priced in terms of border prices because of tariffs or quotas, for example, it is better to subsidize the input than to introduce protective measures for the output that are likely to hurt other industries and diminish the project's competitiveness in the international market (see Little and Mirrlees [4], pp. 115-116).

## IV. Project evaluation: benefits

This section and the following one examine in detail whether the result of appraising a project for regional co-operation can be expected to be different from the outcome of evaluating a similar project in isolation, that is, without co-operation. (A project in isolation implies that domestic production for the national market and possibly for export is more profitable than importing the commodity concerned.) For this purpose, an examination is made of how each of the elements that are relevant to a social cost-benefit analysis of a project for regional co-operation may differ from those relevant to the analysis of a project in isolation. It is assumed that the principles of social cost-benefit analysis are known and that they consequently do not need any explanation. It was stated in the preceding section that the methodology to be used is the so-called Little-Mirrlees method [3, 4]. The main reason for choosing this method is that it seems simpler to apply in practice than, for example, the so-called UNIDO-method [5], although any other method could be used for the same purpose.

When a project for co-operation is compared with a project in isolation that produces the same traded goods in the manufacturing sector, the relevant features for appraisal purposes are size, valuation of outputs and inputs, the rate of discount and the selection criterion. The size of a project for co-operation purposes may be different from that of a project in isolation, and this may lead to differences in appraisal in two respects. Firstly, larger size may lead to lower total average unit

costs if the production process exploits economies of scale. Secondly, differences in size may be relevant to the selection criterion used (the internal rate of return (IRR) or the present social value (PSV)). In calculating the benefits of a project, the present study is confined to considering the output of that project, or what the accounting prices of the output of a project for co-operation are and whether they can be expected to be different from those of a project in isolation. This matter will be dealt with in the present section. Besides examining the consequences of economies of scale on the evaluation of a project for co-operation and a project in isolation, the next section will go into whether the accounting prices of the inputs can be expected to be different for the two types of project.

The principal subject of this section is the differences in benefit (social value of output) to be expected from a project for co-operation and a project in isolation. For the purpose of the analysis, a distinction is made between country A (the country of location of a project), country B (representing the countries that are prospective co-operation partners), and country R (representing the rest of the world). In addition, a distinction is made between projects that produce for import substitution and projects that produce partly for import substitution and partly for export.

For an isolated project in country A producing for import substitution only, the output is valued at the c.i.f. price plus the so-called port-to-user margin (cf. Little and Mirrlees [4], pp. 207-208). This will be called the import price of country A. The imports for which this output is substituted may come from either country B or country R; in both cases the accounting price of the project output is equal to the import price of country A. *For an isolated project in country A producing not only for import substitution but also for export,* the value of the output can be divided into three parts ([4], pp. 182-183):

*(a)* The foreign exchange saved by not importing. This is equal to the volume of imports that would be needed if the project concerned was not undertaken, multiplied by the relevant accounting price—the import price of country A irrespective of the country of origin (B or R);

*(b)* The foreign exchange earned by exporting some of the output if the project concerned is established. This is equal to the volume of exports (excess of production over domestic demand) multiplied by the relevant accounting price. For this part of production the accounting price is equal to the f.o.b. price minus domestic transport and trade cost ([4], p. 208). This accounting price will be called the export price of country A. Domestic demand is the amount of the traded good concerned that would be used if the accounting price is the export price of that good;

*(c)* The benefit to country A of using more of the commodity concerned than it would have used otherwise. More of the commodity will be used because its accounting price is lower when it is being exported instead of imported. This part of the benefit is most difficult to estimate. For the purpose of this examination, however, it is sufficient to know that it is equal to the volume of extra consumption multiplied by the relevant accounting price, which is equal to some average of the import and export price. This accounting price will be called the average import-export price of country A ([4], pp. 183-185).

In what sense does the valuation of the output of a project change where there is regional co-operation? The possible difference in size between a co-operation project and an isolated project may affect the evaluation of the project, because of possible economies of scale and the selection criterion. What matters, however, is the possible differences in accounting prices. A survey of all theoretically possible cases and the corresponding accounting prices, with or without regional co-operation, can be found in table 2. It must be emphasized that some cases dealt with in this survey may be

**Table 2. Survey of accounting prices: project output**

| | | | | |
|---|---|---|---|---|
| | | *No regional co-operation* | | |
| Import substitution | Substitution from B<br>Substitution from R | | Import price A<br>Import price A | Case 1 |
| Import substitution and export | Substitution from B<br>Substitution from R<br>Export<br>Extra consumption | | Import price A<br>Import price A<br>Export price A<br>Average export-import price A | Case 2 |
| | | *Regional co-operation* | | |
| Import substitution | Substitution from R | | Import price A | Case 3 |
| | Substitution from B | Domestic production B (indirect effect B) | Import price A (export price B) | Case 4 |
| | | Domestic production B and imports from R | Import price B | Case 5 |
| Import substitution from B Export to B | Substitution from B | Domestic production B (indirect effect B) | Import price A (export price B) | Case 6 |
| | | Domestic production B and imports from R | Import price B | Case 7 |
| | Export to B | Domestic production B | Export price B | Case 6 |
| | | Domestic production B and imports from R | Import price B, possibly export price B | Case 7 |
| | Extra consumption A and B | | Average export-import price A and B | Cases 6 and 7 |
| Import substitution from B Export to R | Substitution from B | Domestic production B (indirect effect B) | Import price A (export price B) | Case 8 |
| | | Domestic production B and imports from R | Import price B | |
| | Export to R | | Export price A | |
| | Extra consumption in A | | Average export-import price A | |
| Import substitution from R Export to B | Substitution from R | | Import price A | Case 9 |
| | Export to B | Domestic production B | Export price B | |
| | | Domestic production B and imports from R | Import price B, possibly export price B | |
| | Extra consumption A and B | | Average export-import price A and B | |
| Import substitution from R Export to R | Substitution from R<br>Export to R<br>Extra consumption in A | | Import price A<br>Export price A<br>Average export-import price A | Case 10 |

quite unrealistic; they are discussed nevertheless, for the sake of completeness. The two cases of isolated projects discussed above will be found in table 2 as cases 1 and 2, under the heading "no regional co-operation".

As in the case of isolated projects, a distinction is made between a regional co-operation project whose output is meant only for import substitution and a regional co-operation project whose output partly substitutes for imports and partly

is exported. However, if the output of a *project is meant only for import substitution,* it is clearly unlikely to be a project for co-operation. The case will nevertheless be discussed briefly so as to draw attention to the fact that the valuation of the output is different from the corresponding valuation for an isolated project, provided proper account is taken of the possible welfare implications of such a project for the partial customs union (country A and country B together), instead of for country A alone. For that purpose, the origin of the imports of country A that are to be substituted must be taken into account.

If the project output is substituted for imports from country R, the accounting price is, as for an isolated project, equal to the import price of country A. If the project output is substituted for imports from the prospective partner country B, the corresponding accounting price is also equal to the import price of country A, but when the project benefits are being measured, an indirect effect that may occur in country B must also be taken into account, since import substitution in A will also affect the supply situation in country B. If country B's total supply consists entirely of domestically produced goods, it has to divert its export trade flow from A to R, if the project is established. The accounting price of the commodity in B then becomes equal to the export price of country B with respect to R, where previously it was the export price of B with respect to A. The former price can be expected to be lower than the latter: otherwise B would have exported the commodity concerned to country R in the first place. Consequently, such a diversion of an export trade flow from A to R entails a loss for country B equal to the volume of the trade flow concerned multiplied by the difference between the two relevant export prices of country B. Clearly such a loss has to be taken into account if the benefits of a project for co-operation are calculated, as they should be, from the point of view of the partial customs union as a whole. If, on the other hand, the total supply of the good concerned in B consists of domestic production and imports from R, import substitution in A will lead to smaller imports of that commodity into B from R. The commodity's accounting price in B, however, does not change: it remains equal to the import price of country B. In other words, now there are no welfare losses resulting from the indirect effect just dealt with. The cases that have just been examined are cases 3, 4 and 5 respectively, in table 2.

Cases are now considered in which the *project for co-operation produces for both import substitution and export.* For this purpose, a twofold distinction is made: *(a)* with respect to the origin of the imports that are substituted for and *(b)* with respect to the destination of the expected exports. The result is four possible combinations of the country of origin, with respect to import substitution, and the country of destination, with respect to the prospective export trade flows. Each of these combinations may lead to different accounting prices for the project output; so each combination is considered subsequently. For the purpose of the analysis the value of the output is again divided into three parts: import substitution, exports, and additional consumption due to a lower accounting price.

In the first combination, the *project output in A substitutes for imports from B and is also partly exported to B.*

*Volume of imports without the project.* The accounting price of the volume of imports substituted for by the project output is equal to the import price of A. As in cases 4 and 5, a distinction must be made according to the origin of supply in country B: either solely domestic production (case 6 in table 2), or domestic production and imports from R (case 7 in table 2). In the former case, the accounting price of the commodity concerned in country B becomes equal to the export price of B and there is an indirect effect in B; in the latter case the accounting price concerned does not change and there is no indirect effect.

The same distinction as before must be made in respect of the volume of exports from A to B. If country A's exports to B substitute for domestic production in B the indirect effect of import substitution is intensified: still more of country B's domestic production of the commodity concerned is exported to R. The accounting price of this part of the project output is therefore equal to the export price of country B. If, on the other hand, the supply in country B consisted originally of domestic production and imports from R, exports from A to B will lead to decreasing imports into B from R. The accounting price of that part of the project output remains equal to the import price of B until imports from A are substituted for all imports from R. At that point the corresponding accounting price becomes equal to the export price of B. In table 2 these cases are numbered case 6 (solely domestic production) and case 7 (domestic production and imports from R).

*Extra consumption due to a lower accounting price.* It was shown above that the accounting price of the part of the project output that is exported to country B is equal to either the export or import price of country B, depending on whether domestic production or imports from R are substituted for by imports from A. When the accounting price of A's exports to B is equal to the export price of B, extra consumption can be expected in both country A and country B because this price is lower than the previous accounting prices in both countries. The accounting price of this part of the project output is some average of the import price of A (or B) and the export price of B.

In the second combination the *output of the project substitutes for imports from B and is also partly exported, but to R instead of B.* For import substitution the analysis is identical to the corresponding cases (6 and 7) of the preceding combination. As for exports, the situation is simple. The accounting price of this part of the output is equal to the export price of country A. Since the latter price is lower than the accounting price before the project was established, there will be additional consumption of the commodity concerned. The corresponding accounting price is equal to some average of the export and import prices of country A. In table 2 this combination is classified as case 8.

The third combination is *substitution for imports from R, and exports to B.* The accounting price of the part of the project output that is substituted for imports into A from R is clearly equal to the import price of country A. From the point of view of the partial customs union as a whole there are now no indirect effects to be taken into account. For exports to B there is no difference from the corresponding analysis of cases 6 and 7 in the first combination. The same holds for the additional consumption in both countries A and B if the accounting price of the volume of exports to B is equal to the export price of B: the accounting price of the substitution part of the project output equals the average export-import price of A or B. In table 2 this combination is numbered as case 9.

In the last combination—case 10 in table 2—the *project output substitutes for imports from R, and part of the output is exported to R.* In this case the accounting price of that part of the output corresponding to the imports if the project were not undertaken is equal to the import price of country A. The accounting price of the exported commodities is equal to the export price of A, while the price corresponding to the additional consumption that may be expected is equal to A's average export-import price.

Apart from the cases dealt with in the present section, there may be a number of more complicated ones. For instance, the project output may be substituted for imports from B and R or it may be exported to both countries. It will be clear, however, that these more complicated cases are simply combinations of the cases of the present section.

## V. Project evaluation: costs

In the preceding section, possible differences in the benefits of isolated projects and projects for co-operation were dealt with. In the present section, a similar analysis is made of costs. As has already been mentioned as far as output is concerned, differences in size between the two types of project matter only to the extent that the output may be used for different purposes: import substitution, exports to prospective partners, or exports to the rest of the world. This no longer holds if costs are considered instead of benefits, when two possible sources of differences must be distinguished: total average unit costs of larger projects may be lower because of economies of scale, and the accounting prices of the inputs may be different. Economies of scale were dealt with in section II and will come up for discussion briefly again at the end of this section. Differences in accounting prices of inputs are discussed below.

For this purpose, the inputs of a project in isolation and the corresponding accounting prices will be listed first:

| *Inputs* | *Accounting price* |
|---|---|
| Traded goods | Marginal import costs or marginal export revenue |
| Non-traded goods, i.e. land | Capitalized value of marginal product in producing tradables |
| Construction<br>Energy<br>Transport<br>Services | Marginal social cost |
| Skilled labour | Actual salary payments, revalued at accounting prices |
| Other labour | Shadow wage rate |

Each of these items will then be examined to see whether its accounting price will be different for a project for regional co-operation purposes. There is no reason to expect that the accounting prices of traded goods will differ in any way when they serve as inputs for either type of project, with one obvious exception: in the case of project co-operation, the traded good that serves as an input may be produced in another co-operation project with a corresponding accounting price that may be lower than in the case of isolation. Table 2 shows that such a lower accounting price occurs if the project output not only substitutes for imports but also is exported. The latter situation may occur more frequently with co-operation projects than with isolated ones.

The *cost of land* is what it would have been worth in alternative uses. This value is the same for isolated and co-operation projects. The accounting price of a *non-traded good*–construction, energy, transport and services–is according to the Little-Mirrlees method equal to the social cost of providing a little more of that good (cf. Little and Mirrlees [4], pp. 211-212). The Little-Mirrlees method proceeds by breaking down the costs of providing a non-traded good into ultimately the costs of traded commodities and labour. This means that as far as the inputs of non-traded goods are concerned, differences in costs between a project in isolation and a project for co-operation, neglecting for the time being economies of scale, may be due solely to differences in the accounting prices of tradables and labour. Accounting prices of traded goods have been dealt with above and the costs of labour will be discussed presently. Economies of scale can of course not be neglected entirely. Larger projects–which may be more likely in the case of project co-operation than in the case of isolation–may lead to a greater demand for the non-traded inputs, and this in turn may lead to economies of scale in producing the latter commodities.

*Skilled labour.* There is no reason to expect that the costs per skilled worker employed will differ between the two types of project. At most, if the two types of project differ in size, the number of skilled workers employed per unit of investment cost may be smaller in the larger project because of economies of scale.

*Unskilled labour.* The accounting price of unskilled labour -the shadow wage rate or SWR–is, according to Little and Mirrlees, given by the equation:

$$SWR = C - \frac{c-m}{s}$$

where:

$c$ = consumption of the wage earner in accounting prices,

$m$ = marginal productivity of labour in agriculture,

$s$ = the social value of investment relative to consumption.

Little and Mirrlees ([4], p. 270) in fact use a slightly more complicated formula than that given in the present paper, where transport costs and urban overheads are neglected.

To what extent will the SWRs for co-operation projects and isolated projects differ? For $m$ and $c$ hardly any differences at all can be expected. A difference may arise with respect to $c$ because of different accounting prices of consumer goods if the latter are produced in co-operation projects -for import substitution and export–rather than in isolated projects -for import substitution only. This point has already been dealt with above. The differences will probably be less relevant for consumer goods than for industrial inputs.

The only element that has to be examined more closely is $s$, the social value of public investment or uncommitted government income measured in terms of consumption committed through employment. Little and Mirrlees give a very long formula for $s$ ([4], p. 252): for the purpose of the present paper it can best be summarized as:

$$s = \sum_{t=1}^{T} \frac{(1+r)^{t-1}(c-m)\,n}{(1+i)^t}$$

where the meanings of $c$ and $m$ are already known and:

$n$ = extra employment of unskilled labour per unit of investment cost,

$i$ = consumption rate of interest (the rate at which the social value of employment-generated consumption declines),

$r$ = rate of reinvestment (the return on the project that is not committed to consumption),

$T$ = number of years until $n$ is zero (the period it will take the economy to reach a situation in which the proportion of the labour force employed in urban industry is fairly constant),

(cf. Little and Mirrlees ([4], p. 256)).

Will the values of $n$, $i$, $r$ and $T$ for projects for co-operation be different from those for projects in isolation? Obviously $i$ and $T$ can safely be assumed to be the

same in both situations. For $n$ and $r$ this may not be the case. It has already been mentioned that co-operation projects can be expected to be larger than isolated ones. This may lead to economies of scale that may imply that fewer workers will be employed per unit of investment cost than in smaller projects. A lower value of $n$ implies a lower value of $s$ and this in turn results in a lower shadow wage rate. On the other hand, it may also turn out that in larger projects, $r$ is larger than in smaller projects. This leads to a higher value of $s$, implying a higher shadow wage rate for co-operation projects than for isolated ones. Which of the two effects will dominate depends on the actual values of the relevant numbers.

The last point to be considered in the present section is differences in costs between co-operation projects and isolated projects due to economies of scale. The latter phenomenon has been extensively discussed above; so a rather obvious conclusion is sufficient: larger projects may have economies of scale with respect to capital and operating costs, and this may make a co-operation project more attractive than an isolated one, from the point of view of costs.

## VI. Alternative arrangements: the package approach

The selection of a number of regional co-operation projects according to the criteria and methodology explained in the previous three sections can be seen as a starting point for the establishment of what will be called a *provisional package of projects*, acceptable to all members of the regional grouping. With projects allocated to the countries of efficient location, the benefits of economic co-operation are maximized for the region as a whole. This efficient package, however, is likely to be unacceptable to a number of member countries, because project location based purely on comparative advantage may well result in a concentration of regional projects in a few countries only. Where this happens, the benefits of co-operation accrue rather unevenly to a few countries, while others gain hardly anything. It may even occur that some countries lose by such a package, because projects that they might have undertaken—though on a smaller scale—without co-operation are allocated to neighbouring member countries.

One way of bringing about a more even distribution of benefits among member countries is an appropriate system of compensation through transfer prices or direct financial transfers, provided the products involved are competitive at world market prices (which is usually ensured by the proposed methodology). Many countries, however, are reluctant to accept that production foregone can be more than compensated for by the indirect benefits (through pricing) of co-operation. Countries usually place a high value on being a producer, rather than remaining an importer of products of which the promised price advantages still have to be realized.

In these circumstances, each member country may wish to be a producer as a means of securing directly the benefits of co-operation. If this applies to each member country, the distribution of benefits through the allocation of projects becomes of prime importance as a condition for successful and lasting co-operation. Moreover, over time countries will not only want to be better off through an appropriate assignment of projects when committing themselves to regional co-operation; they will also demand their "fair share" of the total benefits of co-operation. Country A, for example, expecting a modest gain from economic co-operation, may well decide to forego this gain if its rival neighbour B has negotiated more than what country A considers to be B's fair share. If, on the other hand, countries manage to negotiate successfully the allocation of a number of projects in such a way that the benefits are distributed equitably, the resulting

package arrangement is probably more stable than any other form of project co-operation, because each member country, being a producer for the regional market, stands to lose by breaking up the arrangement.

To facilitate the exposition, the establishment of a provisional package of regional co-operation projects will be discussed in three steps: *(a)* the package of efficient locations will be considered; *(b)* the construction of more equitable packages will be discussed, on the assumption that no member country should lose by joining a regional co-operation arrangement; *(c)* since countries usually want to be equally better off, other equitable packages will be introduced that assume member countries share the benefits of co-operation more or less equitably.

A package of regional co-operation projects can be characterized by the *effects* of all projects on the member countries as a result of a specific assignment of projects to countries. The overall effect of a package on the region is obtained by simply adding the separate effects of the projects in the package. As with projects, different measures can be used to describe the effects of a package. The *Asian Industrial Survey* ([2], pp. 64-65), for instance, distinguishes five: *(a)* investment, *(b)* employment, *(c)* value added, *(d)* balance of trade and *(e)* total cost of meeting the deficiency in regional supply (the amount by which the supply of each product is deficient in each country, multiplied by the appropriate price in that country—average production cost for domestic production, average delivered price for regional imports, or world market price for extra-regional imports). Deficiency in regional supply can be considered to be the principal measure used in the *Survey* to determine the attractiveness of a package—for each country and for the region, since it allows a meaningful comparison with a situation in which *(a)* all regional demand is met through extra-regional imports, and *(b)* no co-operation occurs (with domestic production, if viable, through a larger number of projects of considerably smaller scale).

In this study one of the measures proposed for the selection of projects, the *present social value* of a project for a given location, will be used as the sole measure of the effects of projects in a package and of the package itself. As the proposed methodology for the evaluation of co-operation projects implies that a project's PSV expresses its ultimate value to the society, the PSV can be regarded as a single, comprehensive measure of the effects of a project. When the characteristics and the attractiveness of the various packages are discussed, no other measures need be taken into account, therefore, although it might be useful to present some of the other measures mentioned above as additional information.

The advantages of using the PSV as a single measure are threefold. Firstly, the use of the PSV as a single measure greatly facilitates the construction of different packages, because the alternative assignments of projects can be determined on the basis of consideration of one measure only. Secondly, the PSV is a direct measure of the benefits of regional co-operation when the PSV implications of each package are compared with the PSV implications of a situation of no co-operation. Thirdly, less additional work is involved in the calculation of the PSV of all regional co-operation projects in their various possible locations, because the data on which the calculations are based are already available from the selection stage.

The foregoing implies that the establishment of a provisional package requires the following information:

*(a)* The PSV for different locations of all regional co-operation projects;

*(b)* For each member country, the total PSV generated by projects established without regional co-operation;

*(c)* Some indication of what the member countries consider an equitable distribution of the benefits of co-operation.

Since the benefits are expressed in terms of PSV, it does not seem unreasonable to relate the distribution of benefits among countries more or less to the distribution of gross domestic product in the region. Other measures, however, such as the distribution of population or investment, may also be used, depending on the preferences of the member countries. Moreover, as most of the co-operation projects are relatively large scale, the assignment of projects to countries will be characterized by substantial indivisibles, and some flexibility with regard to the distribution of benefits is required if a solution is to be found at all.

To illustrate the establishment of a provisional package of co-operation projects, the following (fictitious) data will be used as an example. Seven co-operation projects and three countries are distinguished. The PSV for different locations of the projects is given in table 3.

**Table 3. Present social value for different locations of regional co-operation projects**
(In arbitrary units)

| | *Project* | | | | | | |
|---|---|---|---|---|---|---|---|
| *Country* | *1* | *2* | *3* | *4* | *5* | *6* | *7* |
| A | 100 | 100 | 100 | 50 | 20 | 20 | 20 |
| B | 70 | 80 | 85 | 40 | 15 | 15 | 10 |
| C | 85 | 65 | 75 | 35 | 15 | 20 | 15 |

It is estimated that, if there is no regional co-operation, country A generates a PSV of 210 units, country B of 60 units and country C of 70 units. The three countries agree to share the benefits of co-operation equally so as to favour the smaller countries B and C.

The first package to be considered, the *efficient location package*, gives the assignment of projects to those countries in which their PSV assumes the highest value. This assignment ensures the maximum economic benefits from co-operation for the whole region. It is very unlikely, however, that such a package is suitable for regional co-operation, because the benefits might accrue rather unevenly to the prospective member countries. Table 4 illustrates the situation.

**Table 4. Package I: Efficient location assignment of projects to countries**
(In arbitrary units)

| | *Project assignment* | | | | | | | *Package total* | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Country* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *With co-operation* | *Without co-operation* | *Net benefits* |
| A | 100 | 100 | 100 | 50 | 20 | | 20 | 390 | 210 | 180 |
| B | | | | | | | | — | 60 | −60 |
| C | | | | | | 20 | | 20 | 70 | −50 |
| Region | | | | | | | | 410 | 340 | 70 |

The table shows a heavy concentration of projects in country A, and only one project assigned to one of the smaller countries. The possibility of producing for a regional market apparently implies the shifting of projects from countries B and C to

country A when the principle of comparative advantage is strictly adhered to. Although the benefits of co-operation are maximized, countries B and C lose substantially by participating in such a co-operation agreement.

To ensure that at least no country will lose by participating in regional co-operation, some of the benefits of co-operation for the whole region will have to be given up. An obvious device to achieve a more equitable assignment of projects would seem to be to move from one country to another those projects that cause the *least reduction in PSV.* This criterion, however, does not relate the size of the shiftable projects to the maximum required PSV of the various member countries. If the PSVs of the regional projects differ substantially (because, for instance, projects differ in size), and if the differences in a project's PSV for different locations are somewhat proportional to the project's PSV, the proposed device for the rearrangement of projects is not likely to work satisfactorily, and might not even give a feasible solution at all, as is shown by table 5.

**Table 5. Package II: Unworkable "equitable" assignment of projects to countries**
(In arbitrary units)

| | Project assignment | | | | | | | Package total | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Country | 1 | 2 | 3 | 4 | 5 | 6 | 7 | With co-operation | Without co-operation | Net benefits |
| A | 100 | 100 | 100 | | | | | 300 | 210 | 90 |
| B | | | | 40 | | | | 40 | 60 | −20 |
| C | | | | | 15 | 20 | 15 | 50 | 70 | −20 |
| Region | | | | | | | | 390 | 340 | 50 |

Starting from package I in table 4, projects have been moved from country A to either country B or C, according to the rule that the order in which the projects are moved is determined by the differences in PSV. Projects 5 to 7 are therefore moved first to country C, because the reduction in PSV is only five units for each project. Project 4 is shifted to country B, causing a loss of 10 units. Moving either project 1 to country C or project 3 to country B reduces the PSV for country A to 200 units, which is below its minimum of 210 units. Hence, a project with a smaller PSV should be moved back to country A to keep its PSV above the required minimum. Similar moves, including moving projects between countries B and C, will have to be made for the remaining country. Because of the large number of combinations involved, this procedure, even if it leads eventually to a feasible solution, is not very efficient.

A more systematic way to solve assignment problems of this kind is to formulate the problem explicitly as an *integer programming model,* in which the total regional PSV is maximized subject to distributional constraints. Consider a regional co-operation project $j$, which can be located in each member country $i$ and, unlike in the previous example, has PSV effects on the member countries $k$ for each of its locations. The PSV of project $j$ for the country in which it is located ($i = k$) is positive; the PSV effects on other countries ($i \neq k$) are unrestricted in sign. The total PSV of project $j$ in its efficient location is always positive; other locations of the project are considered only if their PSVs remain positive.

The assignment problem can now be defined as follows. Assign the regional co-operation projects to the prospective member countries in such a way that in each member country a certain minimum PSV is generated and total PSV of all projects is maximized. This problem can be formalized as a special case of an integer

programming model (a zero-one problem), in which the following symbols play a role:

$x_{ij}$ = 1 or 0 = location or non-location of project $j$ in country $i$, $i = 1, \ldots, L$ and $j = 1, \ldots, P$,

$a_{ikj}$ = PSV generated in country $k$ by project $j$ located in country $i$, $i, k = 1, \ldots, L$,

$\mathsf{A}_i$ = matrix of elements $a_{ikj}$ denoting the effect, in terms of PSV, on country $k$ of locating project $j$ in country $i$ (order $L \times P$),

$$\mathsf{A}_i = \begin{bmatrix} a_{i11} & \ldots & a_{i1j} & \ldots & a_{i1P} \\ \vdots & & \vdots & & \vdots \\ a_{ik1} & \ldots & a_{ikj} & \ldots & a_{ikP} \\ \vdots & & \vdots & & \vdots \\ a_{iL1} & \ldots & a_{iLj} & \ldots & a_{iLP} \end{bmatrix},$$

$\mathbf{a}'_i = \mathbf{i}'\,\mathsf{A}_i$ = vector of elements $\sum_{k=1}^{L} a_{ikj}$ denoting the total PSV generated in the region by project $j$ located in country $i$ (order $1 \times P$),

$\mathbf{i}$ = unit vector,

$\mathbf{b}$ = vector of PSVs to be generated by assigning regional co-operation projects to country $i$ (order $L \times 1$).

Define, in addition:

(*a*) matrix $\mathsf{A}$ (order $LL \times LP$) as

$$\mathsf{A} = \begin{bmatrix} \mathsf{A}_1 & & & \\ & \ddots & & \\ & & \mathsf{A}_i & \\ & & & \ddots \\ & & & & \mathsf{A}_L \end{bmatrix},$$

(*b*) matrices $\mathsf{E}_1$ and $\mathsf{E}_2$ (order $L \times LL$ and $P \times LP$, respectively) as

$$\mathsf{E}_n = [\mathsf{I}_n \ldots \mathsf{I}_n \ldots \mathsf{I}_n], \quad n = 1, 2$$

where $\mathsf{I}_n$ is a unit matrix (orders $L \times L$ for $n = 1$ and $P \times P$ for $n = 2$),

(*c*) vector $\mathbf{a}$ (order $1 \times LP$) as

$$\mathbf{a}' = (\mathbf{a}'_1, \ldots, \mathbf{a}'_i, \ldots, \mathbf{a}'_L), \text{ and}$$

(*d*) vector $\mathbf{x}$ (order $LP \times 1$) as

$$\mathbf{x} = (\mathbf{x}_1, \ldots, \mathbf{x}_i, \ldots, \mathbf{x}_L),$$

where vector $\mathbf{x}_i$ (order $L \times 1$) is given by

$$\mathbf{x}_i = (x_{i1}, \ldots, x_{ij}, \ldots, x_{iP}).$$

The *assignment problem* can now be written as:

Maximize

$$\mathbf{a}'\,\mathbf{x} \tag{1}$$

subject to

$$\mathbf{E}_1 \mathbf{A}\,\mathbf{x} \geq \mathbf{b}$$

$$\mathbf{E}_2 \mathbf{x} = \mathbf{i}$$

where $x_{ij} = 1$ or 0 for $i = 1, \ldots, L$ and $j = 1, \ldots, P$.

Matrix A can be considerably simplified if the total PSV generated in the region by project $j$ located in country $i$ is assumed to be concentrated in the country of location itself. With this assumption, all elements $a_{ikj}$ for which $i \neq k$ vanish, and matrix A can be reduced to a matrix $\bar{\mathbf{A}}$ of order $L$ X $LP$:

$$\bar{\mathbf{A}} = \begin{bmatrix} \mathbf{a}_i & & \\ & \ddots & \\ & & \mathbf{a}'_L \end{bmatrix}$$

Simplified in this way, the assignment problem can be written in full as presented in table 6. The first $L$ restrictions refer to the minimum PSV to be generated in each of the member countries through an appropriate assignment of the co-operation projects. The second set of restrictions defines all possible combinations of projects. With $P$ projects and $L$ countries, the maximum number of combinations is $L^P$. Combinations that satisfy the first set of restrictions are feasible combinations. The feasible combination that generates the highest total PSV for the region is the optimal assignment of regional co-operation projects for this formulation of the problem.

Unfortunately, experience with the development of algorithms for solving this kind of problem has not been encouraging. The number of iterations required to reach an optimal solution can be extremely high, even for problems of a relatively modest size. Wagner ([15], pp. 480-488), for example, reports that the *partial enumeration algorithm* is able to solve certain practical problems with up to 100 variables and 50 constraints. In our simplified model, the number of decision variables is equal to the number of member countries times the number of projects *(LP)*, and the number of constraints is $L + P$. Unless it can be reduced sufficiently, the number of decision variables is therefore likely to be the main obstacle to a systematic solution of the assignment problem.

With the present assignment problem, a reduction in the number of decision variables might well be possible. As noted before, there is no reason to assume that each project has a positive PSV in all its conceivable locations. A number of decision variables will therefore have predetermined values (0), because they refer to projects that are only partly shiftable between member countries, i.e. between those countries for which the project's PSV remains positive. A special case is projects that are tied to one or two specific sites because of raw materials requirements, general accessibility, or other factors. This group of projects can be considered almost non-shiftable, and the presence of several of these projects in a package reduces the number of decision variables considerably.

The foregoing implies that the possibility of constructing alternative packages depends very much on the number of shiftable projects that can be moved from one country to another without affecting their PSV by much. The higher the share of such projects in a package, the more alternative arrangements are possible. This is a favourable situation from a distributional point of view, although the optimal assignment of projects may be very difficult to calculate. On the other hand, too low a share of projects that are independent of location might severely limit the number of alternative packages; in some cases there may be no feasible package. It can be concluded overall that an optimal solution to the assignment of regional co-operation

**Table 6. The assignment problem for locating $P$ regional co-operation projects in $L$ member countries**

| | |
|---|---|
| Decision variables | $x_{11}, \ldots, x_{1j}, \ldots, x_{1P}, \ldots\ldots, x_{i1}, \ldots, x_{ij}, \ldots, x_{iP}, \ldots\ldots, x_{L1}, \ldots, x_{Lj}, \ldots, x_{LP}$ |
| Restrictions | $a_{11}, \ldots, a_{1j}, \ldots, a_{1P} \quad \geq \mathbf{b}_1$<br>$a_{i1}, \ldots, a_{ij}, \ldots, a_{iP} \quad \geq \mathbf{b}_i$<br>$a_{L1}, \ldots, a_{Lj}, \ldots, a_{LP} \quad \geq \mathbf{b}_L$<br>$\begin{bmatrix} 1 & & \\ & \ddots & \\ & & 1 \end{bmatrix} \cdots \begin{bmatrix} 1 & & \\ & \ddots & \\ & & 1 \end{bmatrix} \cdots \begin{bmatrix} 1 & & \\ & \ddots & \\ & & 1 \end{bmatrix} \begin{matrix} = 1 \\ \vdots \\ = 1 \\ \vdots \\ = 1 \end{matrix}$ |
| Objective function | $a_{11}, \ldots, a_{1j}, \ldots, a_{1P}, \ldots\ldots, a_{i1}, \ldots, a_{ij}, \ldots, a_{iP}, \ldots\ldots, a_{L1}, \ldots, a_{Lj}, \ldots, a_{LP}$ Max. |
| Remarks | $x_{ij} = 1$ or 0 for $i = 1, \ldots, L$ and $j = 1, \ldots, P$ |

projects can be found using presently available algorithms, provided that the proportion of shiftable projects is sufficiently large to permit the construction of a number of alternative packages, but their absolute number is sufficiently small to keep the number of decision variables within certain limits.

An example of a set of feasible solutions to the simplified assignment problem:

Maximize

$$\mathbf{a}' \mathbf{x} \tag{2}$$

subject to

$$\bar{A}\,\mathbf{x} \geq \mathbf{b}$$

$$E_2\,\mathbf{x} = \mathbf{i}$$

where: $x_{ij} = 1$ or 0 for $i = 1, \ldots, L$ and $j = 1, \ldots, P$

is shown in table 7. All packages of alternative assignments of projects to countries satisfy the minimum distributional requirement that no country loses by

**Table 7. Feasible equitable assignments of projects to countries**
(In arbitrary units)

| | | *Project assignment* | | | | | | | *Package total* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Country* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *With co-operation* | *Without co-operation* | *Net benefits* |
| Package III | A | | 100 | | 50 | 20 | 20 | 20 | 210 | 210 | – |
| | B | | | 85 | | | | | 85 | 60 | 25 |
| | C | 85 | | | | | | | 85 | 70 | 15 |
| | Region | | | | | | | | 380 | 340 | 40 |
| Package IV | A | 100 | 100 | | | | | 20 | 220 | 210 | 10 |
| | B | | | 85 | | | | | 85 | 60 | 25 |
| | C | | | | 35 | 15 | 20 | | 70 | 70 | – |
| | Region | | | | | | | | 375 | 340 | 35 |
| Package V | A | 100 | 100 | | | 20 | | | 220 | 210 | 10 |
| | B | | | 85 | | | | | 85 | 60 | 25 |
| | C | | | | 35 | | 20 | 15 | 70 | 70 | – |
| | Region | | | | | | | | 375 | 340 | 35 |
| Package VI | A | | 100 | 100 | | | | 20 | 220 | 210 | 10 |
| | B | | | | 40 | 15 | 15 | | 70 | 60 | 10 |
| | C | 85 | | | | | | | 85 | 70 | 15 |
| | Region | | | | | | | | 375 | 340 | 35 |
| Package VII | A | | 100 | 100 | | | 20 | | 220 | 210 | 10 |
| | B | | | | 40 | 15 | | 10 | 65 | 60 | 5 |
| | C | 85 | | | | | | | 85 | 70 | 15 |
| | Region | | | | | | | | 370 | 340 | 30 |

participating in regional co-operation. Package III is the optimum package for the present distributional constraints (equation 2), with a maximum PSV of 380 units a reduction of the benefits of economic co-operation by 30 units compared with the efficient location package I, but still 40 units better than without co-operation.

Package III, however, cannot yet be regarded as an equitable package in the sense that the three countries are sharing the benefits of co-operation more or less equally. If these new distributional constraints are introduced, only packages VI and VII are likely to be acceptable to all countries, and package VI will be the optimal package for the new constraints. The total PSV is reduced once more, but as the total benefits still amount to 35 units and its distribution can be considered fair, package VI has a good chance of being accepted by the prospective member countries as the provisional package on the basis of which full feasibility studies can be commissioned for final agreement and implementation.

This third and last step in finding a provisional package can be formalized as follows:

Maximize

$$\mathbf{a}' \mathbf{x} \tag{3}$$

subject to

$$(\bar{\mathsf{A}} - \mathbf{d}\mathbf{a}')\mathbf{x} \leq (\mathsf{I} - \mathbf{d}\mathbf{i}')\mathbf{b} + \mathbf{c}$$

$$(\bar{\mathsf{A}} - \mathbf{d}\mathbf{a}')\mathbf{x} \geq (\mathsf{I} - \mathbf{d}\mathbf{i}')\mathbf{b} - \mathbf{c}$$

$$\mathsf{E}_2 \mathbf{x} = \mathbf{i}$$

where $x_{ij} = 1$ or 0 for $i = 1, \ldots, L$ and $j = 1, \ldots, P$.

The first two sets of constraints are obtained by replacing the minimum PSV requirement vector $b$ by an expression reflecting the distributional preferences of the member countries:

$$\bar{\mathsf{A}}\,\mathbf{x} = \mathbf{b} + \mathbf{d}\,(\mathbf{a}'\,\mathbf{x} - \mathbf{i}'\,\mathbf{b}) \pm \mathbf{c} \tag{4}$$

where:

- $\mathbf{d}$ = vector of country distribution coefficients relating to the benefits of co-operation (order $L \times 1$); $\mathbf{i}'\,\mathbf{d} = 1$, and
- $\mathbf{c}$ = vector of constants allowing a certain variation in the values of the PSV defined by the expression $\mathbf{b} + \mathbf{d}\,(\mathbf{a}'\,\mathbf{x} - \mathbf{i}'\,\mathbf{b})$, (order $L \times 1$).

With indivisible projects, such a variation is necessary to ensure feasible solutions. The earlier requirement that no country should be better off outside the community implies that vector $\mathbf{c}$ is subject to the following upper bound:

$$\mathbf{c} \leq \mathbf{d}\,(\mathbf{a}'\,\mathbf{x} - \mathbf{i}'\,\mathbf{b})$$

It should be noted that the number of constraints has increased from $L + P$ to $2L + P$. As the number of countries is usually smaller than the number of potential co-operation projects, the algorithm for the solution of the model should be able to cope with such an increase in most cases.

One of the main advantages of this formulation of the assignment problem is undoubtedly the systematic way in which a number of optimal provisional packages can be constructed, depending on the specification of the distribution vector $\mathbf{d}$. Specific wishes with regard to the location of projects can be taken into account through predetermined values for some of the decision variables $x_{ij}$ that give the effects on the composition of the package and on the benefits of co-operation. Additional or alternative distributional constraints can be introduced, provided that the size of the problem remains within the limits set by the algorithm for the solution of the model.

## VII. The package approach: some further remarks and an attempt at simplification

Two aspects of the package approach have not yet been mentioned explicitly: they are the timing of projects and the treatment of transport costs. In reality projects do not start simultaneously. Ideally, the optimum timing of projects will have been considered in the preparatory feasibility studies, and differences in timing should be accounted for by duly discounting future benefits and costs with regard to a specific year applying to all projects. Consequently, the actual value of the elements of matrix $\bar{A}$ of present social values of projects in different locations depends on the initial year of the period chosen for the calculation of the present value.

Alternatively, all projects starting within the same period may be grouped into a small number of consecutive sub-packages. For example, if the total package refers to an investment period of 15 years, three consecutive sub-packages with an investment period of five years may be constructed, each comprising projects starting in the corresponding period. If the three sub-packages are subject to an overall distributional constraint, some flexibility in the distribution of the benefits of co-operation can be introduced by allowing compensation at specific times. A country which hardly benefits during the first period can thus be compensated during the next two periods so that for the investment period as a whole it will have received a fair share of the benefits of co-operation.

Transport costs pose more serious problems. No theoretical complications arise if all regional co-operation projects refer to different commodities. Each commodity $j$ is produced in one country $i$ only and, given the demand for commodity $j$ in the other $L-1$ member countries, trade flows can in principle be determined. For each location of project $j$ the corresponding elements $a_{ij}$ of matrix $\bar{A}$—which include the cost of transporting commodity $j$ to the prospective customers—can thus be estimated. When unit transport costs are low, all other $L-1$ member countries are likely to be potential customers; when transport costs are high, some member countries may find it more profitable to import commodity $j$ from third countries.

Complications arise when the same commodity is produced by more than one project. For example, the estimates for the present social values $a_{i1}$ corresponding to project 1 are no longer independent of the location of project 2 producing the same commodity, because the location of project 2 affects the transport costs implied by project 1 (and vice versa) if indeed the trade flows can be determined at all. In such a case the elements $a_{ij}$ of matrix $\bar{A}$ that refer to projects producing the same commodity cease to be independent of each other.

A practical solution to difficulties of this kind could be to take sectors with high transport costs out of the package, and solve the problems of project size, location, timing and commodity trade flows by appropriate sector planning techniques, as proposed, for example, in Stoutjesdijk [14]. For sectors having relatively low transport costs, these costs could be approximated by estimating some average for each project location, which is then assumed to be independent of the location of other projects producing the same commodity. Now the corresponding elements $a_{ij}$ of matrix $\bar{A}$ remain independent, and the assignment problem can be solved with predetermined solutions for projects in sectors with high transport costs.

Finally, an investigation has been made of the possibility of simplifying the method for determining the best package of co-operation projects outlined in the preceding section. It is clear that many people will consider the suggestion to formulate the optimum location problem involved as an integer programming model and to solve it by means of the partial enumeration algorithm as not a very practical

ne. One way to simplify it may be to introduce distributional weights. That is, one ives an additional weight to the present social value of a project if it is located in a ertain country. In this way the allocation of sufficient regional co-operation projects o less attractive countries may be assured in order to arrive at an equitable ssignment of projects. In addition, it might be possible to utilize for this purpose the imple assignment tables of section VI.

If this is done, the first task is to determine the values of the weights. The o-called efficient location assignment (table 4) shows that countries B and C indeed eed additional weights, but it is impossible to determine theoretically how large hese weights should be. For this reason a very pragmatic approach has been taken: a umber of increasingly larger—weights have been tried in order to see how things vork out. First, both countries B and C were given additional weights of 10 per cent. This results in an efficient location assignment which is exactly the same as in able 4. In other words, additional weights of 10 per cent are not sufficient to bring bout a more equitable distribution of projects. Next, an additional weight of 20 per ent was introduced for country B, while that of country C was maintained at 10 per ent. This leads to the assignment shown in table 8.

**Table 8. Weighted efficient location assignment of projects to countries: additional weights 20 per cent for country B and 10 per cent for country C**

(In arbitrary units)

| | *Project assignment* | | | | | | | *Package total* | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Country* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *With co-operation* | *Without co-operation* | *Net benefits* |
| A | 100 | 100 | | 50 | 20 | | 20 | 290 | 210 | 80 |
| B | | | 85 | | | | | 85 | 60 | 25 |
| C | | | | | | 20 | | 20 | 70 | —50 |
| Region | | | | | | | | 395 | 340 | 55 |

t is clear that country C will not be satisfied with this distribution of projects. For his reason the additional weight for country C was raised to 20 per cent. This leads o the following result.

**Table 9. Efficient location assignment of projects to countries: additional weights of 20 per cent each for countries B and C**

(In arbitrary units)

| | *Project assignment* | | | | | | | *Package total* | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Country* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *With co-operation* | *Without co-operation* | *Net benefits* |
| A | | 100 | | 50 | 20 | | 20 | 190 | 210 | —20 |
| B | | | 85 | | | | | 85 | 60 | 25 |
| C | 85 | | | | | 20 | | 105 | 70 | 35 |
| Region | | | | | | | | 380 | 340 | 40 |

Now country A will not be satisfied with the outcome, which shows that this method cannot be expected to be very useful. The reader can easily verify, incidentally, that additional weights of at least 20 per cent are necessary to cause any shift of projects at all.

It will be clear that giving increasingly larger weights to less-well-off countries in the efficient location assignment, and using assignment tables as demonstrated above cannot be regarded as a correct simplified approach. It is more a pragmatic way to remove the worst inequalities from the original efficient location assignment, with only dim prospects of attaining a feasible equitable assignment, let alone the optimum one.

The reason for this is the indivisibles of the projects concerned as may be readily understood by considering package VI—the optimum package—of table 7. In order to have projects 4, 5 and 6 in country B, that country must have an additional weight of 25-34 per cent. However, giving this additional weight to country B makes the location of project 3 in that country more and more attractive. But project 3 should be located in country A in order to give that country its fair share of the co-operation benefits. Similarly, if project 1 is to be allocated to country C, that country's additional weight should amount to some 20 per cent. But this makes project 6 very attractive for country C when it should in fact be allocated to country B.

It can therefore be concluded that, because of the indivisibles of projects, the method of giving additional weights and using assignment tables is not a procedure that leads systematically to a feasible equitable distribution of projects not too far from the optimum.

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# A suggested methodology for the evaluation of projects for regional co-operation

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## PART ONE. IDENTIFICATION AND SELECTION OF CO-OPERATION PROJECTS

### I. Economic and political factors

#### *Introduction*

The significance of co-operation industries cannot be fully understood outside the framework of economic and political integration among developing countries. This does not mean that co-operation projects can be implemented only in common markets or free trade associations, but it does imply that a broad range of issues pertaining to the debates on economic integration are relevant to the identification and evaluation of co-operation projects. The establishment of an industrial co-operation project is tantamount to a partial integration of the economic structures of the participating countries. In a sense, it is a more fundamental integration than trade liberalization.

In general, the need for economic integration among less-developed countries is argued on the basis of the size of the markets. The economic size of the individual countries is too small to make quick and efficient development possible. Through the elimination of the internal trade barriers, the markets of the member States are merged. This larger market makes complete capacity utilization possible; economies of scale can be fully exploited in existing plants and new investment opportunities are created. In our opinion, this argument in favour of integration has been overstressed, the size of the market being neither a sufficient nor a necessary condition for development. Insurmountable problems often arise in existing integration schemes over the distribution of costs and benefits, the allocation of industries and the question of national sovereignty. They indicate that more is involved than the mere size of the market.

Two aspects of the debates on the theory of economic integration are worth mentioning. In the first place, economic integration implies trade liberalization, and the theory examines the effects of the reorientation of the trade-flows on the economic welfare of the participating countries. (J. Viner [84], J. Meade [45], R. Lipsey [38].) From a static point of view, the partial or total removal of trade obstacles between the participating countries decreases discrimination within the union but increases it relative to the rest of the world. The creation of a larger market makes it possible to exploit more fully economies of scale and external effects.[1] The theorists conclude that, considered from the welfare point of view, integration is desirable if trade creation is more important than trade diversion (when consumption effects are allowed for, trade diversion can in certain circumstances also

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[1] For these and other dynamic effects, see B. Balassa [4].

raise welfare (Lipsey [38])), and if the dynamic effects permit a decrease in the cost of production. A higher level of welfare can then be reached for the participating countries, for the same amount of resources.

The second point is that, as was pointed out by H. Johnson [34], the policy that countries normally follow in setting up integration schemes is in contradiction with the conclusions of the theory as to where the greatest advantage of the customs union lies. When entering such a scheme, countries aim to replace as much as possible the imports from third countries by national production, avoiding at the same time engaging in too fierce a competition with the partners' industry. Johnson, like C. Cooper and B. Massel [20], asks why, if free trade is an optimum situation, do Governments want to be compensated for granting tariff concessions. The answer given in the two contributions is the same: "There exists a collective preference for industrial production" (H. Johnson [34], p. 258). In that case, social welfare depends not only on the private consumption of goods and services but also on a collective preference for industrial production. It is this social welfare function that Governments will use in their planning decisions. The theoretical analysis stops, however, where it starts to be interesting. Although the authors admit that the reasons underlying this collective preference are important for determining the exact form the decisions will take, they do not attempt to analyse them any further. In discussing co-operation projects and the way to select them, an analysis of the reasons why preference is attached to industrialization as such becomes essential. If we do not know why politicians insist on industrializing quickly, we have no means of determining what the criteria are that have to be used in selecting the projects that contribute most efficiently to the aim.

### *Short survey of existing integration schemes*

The two aspects of the theoretical debate (trade liberalization and preference for industry) reflect the stages in the integration process, as experienced in most of the common markets among third world countries. The scheme normally starts by abolishing internal trade barriers and erecting a common external tariff. The usual effect is that the most industrialized countries develop faster, as a result of the larger protected market, and the poorer partners bear part of the cost of this industrialization. The less-developed countries are not satisfied with this situation and ask for compensation. The measures for fiscal compensation devised by many customs unions to solve this problem only partly satisfy the less-developed members. They want industrial production of their own and they want the richer partners to help them achieve this. In accordance with the basic idea of free trade, measures for the co-ordination of industrial policies are elaborated. The co-operation is grafted on to the free-trade structure and is usually not very effective. At the same time, the more advanced countries are dissatisfied because the integration scheme does not bring them what they wanted: the establishment of a fully integrated industrial structure.

Surveying very briefly the various forms economic integration among third world countries can take, we roughly distinguish three groups, classified according to increasing degree of collaboration and co-ordination of policies. The first group contains the schemes or parts of schemes that rely mainly on trade liberalization measures. The pure customs unions (no internal trade barriers, common external tariff) have proved to be unworkable. In most cases, tariffs are reduced rather than removed, the reductions apply to only a limited number of products, a common

external tariff rarely exists, and compensation schemes are introduced to achieve a politically acceptable distribution of the benefits derived from market expansion. This compensation mostly takes the form of a budget-to-budget subsidy. In the Communauté économique de l'Afrique de l'Ouest (CEAO), for example, a subsidy is given to offset the loss of tariff income suffered by the importing countries. The "taxe unique" in the Union douanière et économique de l'Afrique centrale (UDEAC) is a tax levied on the products produced in one of the countries and sold in the common market. It is distributed among the participating countries according to the volume of their purchases. The Distributable Pool of Revenue set up in the East African Economic Community (EAEC) on the recommendation of the Raisman Commission served the same purpose, but the present transfer tax is of an entirely different nature. It provides a means of making an exception to the free-trade principle in the common market, to protect a newly established national industry. This last policy measure, designed to facilitate the establishment of new industries without really co-ordinating the investment decisions, provides the link with the second type of integration scheme.

In order to promote industrialization more efficiently than through trade liberalization, schemes are devised to enable some form of co-ordination of investment decisions. In the Regional Co-operation for Development (RCD) scheme, a country that wants to invest in an industry whose production capacity largely exceeds the national demand seeks to persuade its partners to conclude agreements for the purchase of specified quantities. The complementary agreements in the Latin American Free Trade Association (LAFTA) are another way to promote industrialization by stimulating the buying and selling of inputs and outputs in the region. The Central American Common Market (CACM) falls only partly into this category, insofar as it intends to promote industrialization by co-ordinating production in the existing industries in the various countries. Since, however, the objective of CACM is to achieve some degree of regional industrial development planning, it is more appropriate to put it in the last category.

The above-mentioned schemes that aim to promote industrialization by co-ordinating existing production or by offering Governments the opportunity to seek large markets for their large-scale investment projects seldom produced spectacular results, especially as far as the distribution of industries was concerned. A need was therefore felt to embark upon regional planning schemes. The most ambitious one is probably the CACM's Regime for Integration Industries. Other attempts to plan the deployment of industry at a regional level are the UDEAC's Convention on Industrial Harmonization and the EAEC's Kampala-Mbale Agreements. None of these schemes has been very effective either in creating new industries or in distributing them.

### *Analysis of the results*

We shall now briefly analyse the reasons for this lack of success of the various forms of co-operation mentioned above. The failure to achieve a balanced distribution of advantages and disadvantages has often been quoted as one of the main obstacles to the smooth functioning of the integration schemes and one of the main reasons for their disintegration. Because trade liberalization proved to be an insufficient instrument to promote industrialization and favoured the most industrialized partners at the expense of the poorer ones, the need for regional investment planning was stressed. Although in some cases a genuine effort has been

made to co-ordinate the investment decisions and to insist on the need to use regional criteria when deciding the location of particular industries, most of the integration schemes remained fundamentally free-trade areas. The investment co-ordination mechanisms were often set up to give the poorer countries an incentive to remain in the free-trade zone. While safeguarding the market for the exports of the richer partners, the consultation and co-ordination mechanisms did next to nothing to promote the industrialization of the poorer countries.

This is in particular true of the three African common markets (EAEC, UDEAC, UDEAO), which were originally nothing more than the continuation of the free-trade areas existing during the colonial period. These large protected markets served mainly the interests of the metropolitan industry, whose products were granted preferential treatment, and its overseas subsidiaries whose production circulated freely in the region. After independence, this kind of scheme favoured especially the already most developed partners: Kenya in the EAEC, Ivory Coast and Senegal in the UDEAO, Congo and Gabon in the UDEAC. In none of the common markets did the mechanisms introduced to achieve a better balance in industrial development prove to be effective. Even in the case of LAFTA and CACM where the rules for trade liberalization and investment co-ordination were laid down together, the trade liberalizing measures were the most explicit and proved to be the most efficiently applied.

The problem of achieving a politically acceptable distribution of the benefits of integration cannot be solved by schemes for financial compensation, as experience has shown. There is undoubtedly a strong preference for industrialization in the development strategies of most countries (developed as well as developing). The preference for industrial production as such can be explained by the fact that external effects are supposed to be more important than, for example, investment in agriculture or in services. The total additional value added created by an industrial project exceeds the value added directly created by its production alone: the profitability of other production units is improved through the various kinds of linkage that exist within the industrial structure. These beneficial effects are supposed to be greater for the "pushing" (J. Tinbergen [67]) or "industrializing" (Destanne de Bernis [25], [26], [27]) industries.

Adherence to an economic co-operation scheme is seen as a means of speeding up or intensifying industrialization. If, then, trade liberalization is incapable of promoting either more complete industrialization in the richer countries or accelerated development in the poorer ones, why has it not been abandoned in favour of comprehensive schemes of investment co-ordination, accompanied by special purchasing agreements? The reason is that the form the co-operation can take is strictly limited by the different national vested interests. Reliance on the market mechanisms through trade liberalization entails a minimum loss of national sovereignty and interferes least with power relations (economic and political) between countries. As tariff reductions favour the already established industries, they consolidate the existing socio-economic structure by orienting future development according to past and present patterns. The gains per industry may not be spectacular, but market expansion helps to improve the profitability of the plants concerned.

The risks involved in the operation are small. If an importing country sets up its own industry, the tariff concessions can be withdrawn and protective tariff barriers erected. As the exporting industry was probably set up in the first instance to satisfy domestic demand, the loss of the export market will not have dramatic consequences. Through trade liberalization, the richer members of the free-trade area

are able to develop their industrial structure with the help of the poorer ones. The advantage they obtain is helpful but not of vital importance. But neither do they have to run excessive risks, or give up any of the advantages associated with their higher level of development.

In the case of industrial co-operation, the potential advantages are much larger, but the risks are also considerably increased. The main advantage for the richer countries is that more complete industrialization becomes possible, or at least much cheaper, when preferential access to the integrated market is guaranteed by special agreement. The risk, however, is twofold; when partner Governments break the agreement, the losses will be larger, and concessions will have to be given to other countries in order to induce them to sign the agreements. These concessions will imply not only financial compensation, but also the allocation of co-operation projects to the other countries. This means giving up the right to establish a similar industry during the period of the co-operation agreement. While this does not constitute an important drawback for the poorer country, the more-developed country may find it too high a price to pay. It may prefer to forego the immediate establishment of some industries in co-operation so as to keep its options open in case an interesting opportunity arises in the near future.

Another important political aspect needs to be stressed. Not only is there a problem of distribution of costs and benefits between countries; there is also an even more fundamental problem of the distribution of costs and benefits among different groups and classes within countries. It is not sufficient that participation in a co-operation scheme in general or a project in particular leaves a net benefit to a country, measured in some general terms. The interest groups that will benefit must have more influence on the decision-making process than those that obtain no advantages or that will suffer from the implementation of the project.

Fundamentally, development can be only a national process. The development strategy reflects the way the ruling economic and political groups feel the economy should evolve. It contains the blueprint of the future structure of production and distribution that the groups in power consider to be best, and the way to reach it that they consider most efficient. The projects implemented and the policy measures taken correspond in general with their interests and consolidate and reinforce their economic and political position. How adequate a development strategy will be to trigger off a self-sustained process of growth, permitting an improvement in the standard of living not only of the ruling groups, but also of the whole population, depends on a number of factors too complex to analyse in this paper. Co-operation is not a strategy in itself; it is a means of facilitating the achievement of national objectives. The areas and modalities of co-operation are determined by the national development strategies. Co-operation has no dynamism independent of the impetus given by the participating Governments in the pursuit of their national interests.

In many cases, foreign multinational companies are likely to be the main beneficiaries of the co-operation scheme. They will be quicker than local industry to seize the opportunities offered by the protected, integrated market and establish a production unit that captures the whole of the regional demand for the product concerned. They will not be able, however, to force a decision to their advantage without having the support of a powerful lobby in one of the countries. Nevertheless, their influence can work both ways, because they might also be worried about losing their market share to a rival firm with its lobby in a partner country. In that case, they will support the establishment of industries on a national rather than a regional basis. In most co-operation schemes, some examples of this influence of foreign firms allied with local lobbies can be found.

### *Implications for the methodology*

From the preceding brief survey we can conclude that, even if some forms of co-operation are economically beneficial to all the participating countries, they will not be implemented if there is strong politically-motivated opposition. In general, the opposition can be motivated by the reluctance to give up national sovereignty; in particular, it may come from powerful national economic lobbies that fear they will be either losing, or not gaining enough. The richer countries tend to insist on trade liberalization and the poorer ones on regional planning of industrial investments: conversely, rich countries are afraid of jeopardizing their national industrialization by agreeing on regional planning, and poorer members are unwilling to go on financing the industrialization of the partners by continuing to import their products. As comprehensive schemes of their trade liberalization or industrial planning are doomed to fail, the solution lies in a systematic search for specific action for which the conditions of economic as well as political feasibility are fulfilled.

As far as industrial co-operation is concerned, the problem is to select projects that are most likely to be accepted on economic and political grounds. In a sense, trade liberalization and industrial co-operation are alternative means of achieving the same end. While co-operation can make a more fundamental contribution to industrialization, the costs and risks associated with it are higher, especially for the richer countries. To establish a specific industry, a country can seek the previous agreement of its partners to open their markets to the product (co-operation), or it can invest first and then ask its partners to reduce their import tariffs. Which procedure will be chosen depends on the relative size of the potential gains, costs and risks of each case. The identification of possible co-operation projects, discussed in the following chapter, is mainly based on this consideration.

For an in-depth evaluation of the effects of projects that have passed the first test of feasibility, national interest is the starting point. The analysis has to determine how co-operation can most efficiently help to achieve the objectives of the national development strategies. As national industrial development is the ultimate aim, co-operation must be seen as a transitory phase. This has important implications for the optimum size of the projects and the period for which an agreement is signed. While analysing the projects, total effects (i.e. including the effects on the rest of the economic structure) should be calculated, and all the relevant policy aims should be taken into account. The total net gain derived from the projects by the country where they are located, measured in units proper to that country, will constitute the basis of comparison for the selection of the best location and the proposal of a feasible package of co-operation industries. During all the stages of the methodology, an optimum combination of economic analysis and political decision making is essential to the success of the operation.

## II. Methods of selection

### *Institutional framework*

When a methodology is being devised for the selection of projects for regional co-operation, the institutional framework is of great importance. It will determine the field open to co-operation, the legal and administrative procedures to be followed and the institutional and fiscal arrangements for the operation of the projects. The principles of the co-operation are formulated in a convention, treaty or agreement, and there exists a set of institutions (technical commissions, ministerial councils, meeting of heads of state) in which decisions on co-operation policy are taken. As close collaboration between planners and decision makers is essential for the

usefulness of the methodology, the identification-evaluation-selection procedure has to be tailored to match the principles and institutions of the co-operation scheme.

We will assume that no customs union exists or that the existing one has no influence on the co-operation scheme. This allows us to avoid complications from interference between the customs union rules and industrial co-operation and makes it possible to treat the problems of co-operation as generally as possible. There is no general predetermined system of fiscal compensation, and in each case *ad hoc* regulations can be worked out to distribute costs and benefits equitably. The form the redistribution takes will depend on the levels on which the partners decide to co-operate (finance-inputs-outputs). The co-operation agreement states the aims of the scheme and also the levels of co-operation.

Projects can come from two sources. Firstly, each participating country can submit projects to be located on its territory and to be implemented in co-operation. Secondly, projects can be suggested by a group of planners working under the co-operation authority and with no institutional links with the national administrations. In both cases, the projects have to be analysed by the group of planners and the results of the analysis presented to the decision makers. The treatment of the nationally proposed projects is, however, considerably simpler. The project no longer has to be identified, and one (or more) of the three main aspects of the project (technique of production, location, timing of implementation) has already been determined, which simplifies the analysis and makes it possible to proceed immediately to later stages of the methodology (evaluation and comparison).

In order to cover as many aspects of the problem as possible we will assume that all projects have to be identified, analysed and selected centrally by the group of planners, i.e. there are no projects suggested by countries. The co-operation planning team (CPT) is supposed to have at its disposal all relevant information and to be able to obtain additional data from the national administrations. Moreover, the team is in permanent contact with the regional co-operation authority (RCA) and is able to gauge the feelings of the Governments of the participating countries directly.

One more preliminary point has to be made about the time horizon of the co-operation agreement. We assume that the agreement has been made for a 10-year period. At the end of the 10 years it can be terminated, modified or renewed. The horizon lies too far in the future to make any useful assumptions about what will happen then. For the sake of simplicity we assume that there will be no revisions of the agreement or withdrawals from it before the end of the 10-year period. The 10 years are roughly divided into two five-year periods: a gestation phase and an operational phase. During the gestation phase the analysis of the various projects is carried out, implementation is decided and planned, and the investment is started. The gestation period ends in the fifth year, the project is ready to start production at the beginning of the sixth year. Five years later, at the end of the agreement, projects are assumed to have reached a normal efficiency level. The sixth and tenth years will be of particular importance for the determination of the production capacity of the project and the calculation of its efficiency. The assumption that all projects have the same gestation period and reach efficiency at the same moment is obviously unrealistic, but it facilitates the discussion of the general case, and it can easily be removed in the analysis of particular projects.

During the identification phase, the CPT has to find out in which areas co-operation would be worthwhile and which are the most indicated techniques of production. Starting from the RCA's guidelines, and studying the economies of the participating countries, the CPT has to present a set of prima facie interesting co-operation projects.

### *Upper and lower bounds*

We mentioned in the first section that political as well as economic criteria have to be used to determine what makes a good co-operation project. In the first place, projects that fall below a certain minimum size (production capacity) will not be politically acceptable for co-operation. Economic and political interest have almost exclusively a national basis. From a political point of view, co-operation is feasible only if it serves the national interest in a situation where no national investment can be made.

Co-operation between different countries must be necessary to make the project feasible. Otherwise, countries would already have implemented that kind of project, or it would (or could) be in their national development plans. In either case the project would not be accepted as a regional co-operation project. A project that is not big enough but is nevertheless accepted will very probably fail after a short period. Countries will be tempted to start their own production, as has been illustrated by the outcome of most of the integration schemes. In most cases, the project concerned will produce for the domestic market of the participating countries, although some part of the production can be exported.

We will not deal with the problems associated with co-operation for exports. In most cases this co-operation will be in the field of marketing, price fixing, determination of export quotas, and the like, rather than in the field of production. Cases do arise, however, where collaboration between different countries is necessary (to exploit, for example, a mineral deposit located on the border), and where the product will be almost entirely exported. Although we feel that many of the suggestions made in the methodology can be applied in the case of co-operation for export, we do not treat the problem explicitly in the present paper.

If projects for which co-operation is not really necessary and which could be undertaken on a national basis in one or more countries were allowed on the list, they would most probably not be adopted. If they were, their implementation and operation would be based entirely on political goodwill, which is a slender basis for an investment policy. If there is any danger of duplication, it is not worth starting work on such a project. There is probably a good deal of economic duplication, but it takes stronger measures than investment co-ordination to counteract it (United Nations [74]). This view is also adopted by E. A. G. Robinson [53] when he writes: "Outside a few exceptional industries, most technical economies are exhausted by firms of quite moderate size. Even relatively small and poor countries can have a number of firms of minimum size to give full or almost full technical efficiency" (p. XVII). Projects must have some minimum size in order to be "negotiable". If this criterion is not fulfilled, a long period of haggling and bargaining will be necessary and will often lead nowhere. Such projects will never be implemented, or countries will withdraw their original commitment when a better opportunity offers itself. Agreements on such projects can be reached only on a very short-term basis, and it is not certain that the costs of bargaining, repeated analysis, conferences and committees will be outweighed by the benefits of co-operation.

Where the criterion of political feasibility sets a lower limit to the size of the projects that can be considered for co-operation, the economic feasibility criterion permits a determination of their maximum size. Co-operation may indeed not imply that the participating country will be worse off after the agreement than before. Countries that agree to buy a product from a plant located in a partner country will expect to pay no more than the price they would have to pay on the world market. Moreover, they will ask for some kind of compensation for abandoning the right to establish a similar industry themselves. This condition can be fulfilled only if

the project has some minimum efficiency. Even if the industry is desirable on political grounds, it will be a permanent bone of contention if a minimum efficiency is not attained.

As the ultimate aim of co-operation is the establishment of national industries, the period for which the agreements are signed must not be too long. At the end of the period, the co-operation plants must have reached normal efficiency in producing for the integrated market. Moreover, production for the regional market, minus the demand of the most important partner countries and plus the possible increase in exports outside the region, must be possible without too heavy losses. The chances are indeed real that at the end of the period (if not before), particularly the partners with the larger market will end the agreement and set up their own industry. In order to minimize the risk of heavy losses, this consideration has to be taken into account when the maximum size of the plants is fixed.

Neither the minimum nor the maximum size of the projects can be defined unambiguously, because they are based on a political evaluation of national interest and efficiency. The effects of projects can indeed not be measured by cost reduction alone; other considerations (policy aims and their respective weights) have to be introduced in the analysis. This can be done only during the later stage of a thorough analysis of identified projects. It is, however, possible—and desirable—to introduce elements from the development strategies of the different countries (and of the co-operation aims if they have been defined) during the identification phase. The national development plans contain information on the industries or sectors that are of particular importance, and the national Governments can be asked directly or through the RCA how they feel about co-operation in certain areas. This will enable the CPT to distinguish between important and less important sectors or industries, and avoid wasting time and energy on uninteresting projects. This corresponds with Brewster's suggestion that in the selection of projects the economic and the political approaches should be combined (H. Brewster [11], p. 48). Recently the need to strengthen the links between development objectives and project appraisal has been analysed by H. Schneider, who particularly stresses the need to introduce policy objectives at early stages of the analysis (identification) (H. Schneider [59], p. 57). We now briefly discuss the procedure to reduce the infinite number of possible projects to a set of "identified" projects, set aside for further analysis, applying the principle of the lower and upper bounds.

### *Sectoral studies*

The lower and upper bounds are the framework in which the identification of projects has to take place. Starting from a general overview of the economies of the participating countries, the CPT has to get a more detailed knowledge of the problems and possibilities of the different production sectors in the individual countries and in the region as a whole. Three sets of data have to be confronted for each sector: the demand for the various products, the production capacity, and the available resources. Starting from an in-depth analysis of the economic structure at this moment, the planners have to make a forecast of how the economies of the member countries will look at the end of the co-operation period. This forecast can be made by extrapolating past trends, taking into account the general orientation of the development plan and the structural changes that will occur if it is implemented. It is clear that this kind of analysis will never give unambiguous or objective results. Much will depend on the assumptions that underlie the study and reflect the planners' informed guesses about the future evolution of the different

economies. If the course of future events is highly uncertain or if the people hold differing views about what is most likely to happen, upper and lower estimates can be worked out that describe the degree of ignorance about the evolution of a particular sector or of the economy as a whole.

Information for the analysis of the existing production and consumption structure usually exists in the departments of the various ministries, national development banks, agencies concerned with rural and industrial development and similar institutions. The work to be carried out is mainly the organization of the available national data in a uniform framework, so as to permit a comparison of the country's economic structures. Apart from the analysis of the composition of demand, and its satisfaction through imports and local production, it is important to look at the country's economic potential. This potential consists firstly of mineral resources, on which a more or less detailed survey exists in most countries. A country's hydroelectric potential is also usually easily definable. Whether these potentials will actually be developed and become "resources" is another question that need not be solved at this level. More difficult, however, is agricultural potential, a concept that becomes rather vague, because the range of possible crops depends on not only the properties of the soil and climatic conditions but also economic data (relative prices) and aims of the Government. How the economic potential will be used will depend on the action of private entrepreneurs on the one hand and of the Government on the other. This point has to be examined in the second stage of the sectoral study.

If no structural changes occur, the extrapolation of past trends is an acceptable method of finding out what demand will be in future. This can often be a useful assumption as far as consumption goods are concerned. Unless the Government is going to intervene actively in the remodelling of consumption patterns, an appropriate consumption function can be formulated that permits an estimate of the evolution of future demand. Because of the lower bound on the co-operation projects, we are interested only in products that are imported at present. If the product is already produced in one of the countries, co-ordination of industrial investment is obviously not necessary, and trade liberalization measures can perhaps be considered.

The demand trend can be extrapolated only on the basis of carefully specified assumptions about the evolution of total income and its distribution, and of relative prices. The obvious source for the assumptions about the evolution of income and its distribution is the development plan and other policy documents. Mid-term plan reviews, reports on the implementation of the plan and economic statistics make it possible to get a clearer view of the realism of certain plan assumptions, and to obtain a more correct idea of future developments.

Future demand depends not only on the evolution of income, but also on future prices. For consumer goods, as well as for intermediate and investment goods, two sets of prices are needed. First, the future opportunity cost of the product concerned has to be calculated. If there is no local production, the product has to be imported and the opportunity cost will be equal to the c.i.f. price. The present level of international prices cannot always be taken as a reliable guide to the future level, and an informed guess will have to be made about the probable evolution of the world market of the products concerned. The import price is not necessarily the price at which the product is sold to the consumers or users. Governments determine the consumer prices by levying taxes or granting subsidies. In order to be able to estimate future demand, the CPT needs to know what the Government's price policy will be. The prices at which the Government intends to offer consumer goods or intermediary products to the consumers and users is an essential piece of

information, since it will determine the size of the market and therefore the necessary production capacity of the co-operation projects. The prices fixed by the Governments for consumer goods reflect the level of welfare that will have to be reached at the end of the planning period, and the co-operation project is a means of minimizing the cost of attaining it.

For producer goods, not only the volution of incomes and prices, but also the whole pattern of sectoral development as formulated in the development plan, become important. Where consumer demand is largely determined by market forces, the demand for investment goods and inputs will depend to a large extent on the structural changes the economy experiences and will undergo in the next years. The present and future pattern of investment determines largely what kind of equipment and what kind of inputs will be needed in the future. This is true not only for industry but also for agriculture. Of particular importance is government policy on agricultural development; the realization of a "green revolution" or other rural development scheme creates a demand for certain types of investment goods (construction and equipment) and of such inputs as fertilizers and pesticides that can be satisfied by local (or regional co-operation) industry.

The development strategy determines how the available economic potential will be used. It is only in this framework that the "economic resources" that have to be developed can be defined: the minerals that can be obtained through mining operations, the agricultural products that can be cultivated in old and new rural development schemes, the hydroelectric and river valley development schemes that can be started. Much of the inspiration for the identification of co-operation projects comes through consideration of the supply side rather than through an exclusive examination of demand. The strongest case can, of course, be made for projects that, from the point of view both of demand and of supply of inputs, play a key role in the development strategy (e.g. mining operations supplying raw materials to a fertilizer factory that produces cheap fertilizer for a priority rural development programme).

When the results of the sectoral studies of the partner countries are put together, a picture will emerge of the production activities that might be undertaken in a co-operation framework. The sectoral analysis enabled the CPT to identify certain production activities: it now has to go down to the project level and study the technical means by which the products can be manufactured.

### *Technical production means*

During the previous stage of the analysis, a rough knowledge was needed of the way in which the products that were studied could be produced. If the production capacity of a particular industry was so low that the national market of one of the countries was large enough to enable it to operate efficiently, the project was not set aside as a possible co-operation project. Now the CPT has to proceed systematically, and has to list for every production activity the various techniques that can be used. The planners have then to make a first selection, eliminating techniques that are inefficient because they require too large a scale of operation.

The production techniques that are retained for further analysis must have a production capacity between the sizes of the demand in the fifth and the fifteenth years, with a preference for the techniques that have a capacity equal to the demand provision of year 10. If the production unit is too small, potential economies of scale are not exploited, and the production will be less efficient than it could be. If the

plant is too large, it takes the project too long to become profitable, and investment risks are too high. As the suggested period covered by the co-operation agreement is 10 years, and the agreement is likely to be revised after that date (if not earlier) it would be unwise to adopt a production technique that will not be efficient by then. As countries (probably the largest ones) might withdraw from the agreement to set up their own production, too large a project may be doomed to be inefficient for a very long time.

The risk of partners withdrawing at the end of the agreement is difficult to estimate, but the loss resulting from various patterns of withdrawal can be calculated. Alternative outlets might be found, and the conditions under which exports to the world market are possible can be examined. The politicians, after being informed by the CPT about the losses implied by the various outcomes possible after the end of the agreement, will have to decide how much risk they are willing to run. This provides the CPT with sufficient information to fix the maximum size of the co-operation projects.

It may seem that, by focusing on productive capacity, we are stressing only one aspect of the project, namely its productive efficiency or its cost-reduction capacity. One of the key elements of the suggested methodology is that development is a multi-dimensional process and that Governments are likely to pursue different objectives at the same time. Whereas theoretically Governments can depart, within their own country, from pure economic efficiency, for example, to create more jobs, the margin for manoeuvring is much smaller in the case of co-operation projects where the partners demand efficiency (low prices) and a share in the project's gains. If minimum efficiency is not realized, the projects stand no chance of being accepted. The production capacity determines the range within which the production is likely to be efficient. Once this basic requirement is fulfilled, room is made to introduce the other development objectives into the analysis. This will be discussed in the following chapters. In the present context, we are concerned only with the problem of ensuring the basic efficiency of the identified co-operation projects. The error made by using this rough criterion is unlikely to be important for either large-scale or smaller-scale technologies.

The large-scale projects are unlikely to be more efficient per unit of capital invested in creating jobs or saving foreign exchange. If they are eliminated because they are inefficient in cost reduction (because of the heavy fixed-cost charges) it is unlikely that they would have been included in the list of feasible technologies if their efficiency in, for example, job creation had been taken into account. At the lower end of the scale, however, smaller projects may be inefficient in cost reduction, but create an important number of jobs. If the minimum size requirement is met, the project will have been set aside for further analysis. If not, the project can be established on the basis of national markets. In that case, co-operation would be an inefficient means of handling the problem because of the length of the preparatory analysis and negotiation. It would be simpler to set up the industry for the domestic market and to seek access to the markets of other countries.

One more complication should be mentioned. It is often the case that the production of a particular product can be divided into a number of individual projects that do not necessarily have to be located on the same spot or even in the same country. Instead of formulating one large project with its technical variations, the different small projects should be considered individually, and an optimum technique of production and an optimum location should be selected for each of them. Afterwards, the possible combinations of the small projects to constitute the large one should be examined. We discuss this problem in more detail in the following chapter.

# PART TWO. EVALUATION OF PROJECTS

## III. Criteria for evaluating regional projects

### *Introduction*

The problem of selecting co-operation industries has rarely been tackled in the literature. Some programming models have been formulated, however, and there are also a few suggestions as to how cost-benefit analysis can be modified to cope with the specific aspects of co-operation projects. In order to get an idea of the full dimension of the problem and how it can be solved in a theoretically satisfactory way, we will briefly look at some of these contributions. In its most general formulation, the problem can be described as the optimum allocation of resources to different countries. On the highest level of generality, all the models can give us a definition of optimum allocation, but this is not very useful because of the simplifying assumptions necessary to make the problem manageable. As the generality decreases, more realistic assumptions can be made, making the results more useful but limiting the scope of the optimality of the solution.

H. C. Bos and A. Kuyvenhoven tackle the problem on its most general level: the optimal allocation of investment (and production) to the partner countries. In their model it is assumed that the location of the plants is given and that only one technique of production per product is used in each country. Techniques can differ between countries and so can the population size. The objective is cost minimization and the solution is obtained by using classical (Lagrangean) optimizing methods. The limitations of the approach are clear. By assuming that the choice of production technique and of location is made and by ignoring the aspect of the timing of investment, the most difficult problems of the selection of co-operation projects are side-stepped. Some interesting results are obtained, however, concerning the influence of transport costs, population size and comparative advantage on the optimal allocation of production between the countries ([10], pp. 93-100).

Limiting the scope of the optimization to the allocation of co-operation industries, L. Mennes [46] constructs a more realistic model. In his approach, economies of scale can occur and the indirect effect of projects on each other are taken into account. By using incremental cost (the production cost of the new projects) in the minimand, he makes some rather awkward assumptions about the evolution of production in the industries existing in the base year. The new projects are not to change either the pattern of imports or the production cost of the existing industries between the base year and the target year. Old projects do not profit from cost reductions obtained in new projects that cater only for the increment in demand.

H. C. Bos and J. L. Enos, after criticizing the Mennes model, briefly examine the ways in which it could be improved. Replacing in the objective function incremental cost by total cost, their model becomes rather complicated because not only the cost of the new projects has to be taken into account, but also the effect of the new projects on the cost of the existing production. This comprehensive model seems to give theoretically the best results: the different aspects of the projects are considered (location, technique of production), indirect as well as direct effects are taken into account, and political factors appear in the constraints. The weak point of the model, however, is its applicability. For the model to be applied, input-output tables have to exist for all the partner countries, which is often not the case. Even if they do exist, the dimension of the programming problem is likely to exceed by far the

computational capacity of the algorithms used for solving integer programming problems ([9], pp. 114-115).

Starting from this general equilibrium-programming model, more manageable models can be obtained by focusing on one or some of the aspects of the general model, while neglecting the others. G. Gilbert [30] stresses the structural (indirect) effects of the projects. He relies on an integrated comparison of production and trade structures and on the definition of investment priorities in order to identify co-operation projects. His aim is the optimization of inter-industry linkages, measures in the way suggested by H. Chennery and T. Watanabe [16]:

$$u_j = \frac{\text{total purchase of intermediate inputs of industry } j}{\text{total output of industry } j}$$

$$v_j = \frac{\text{total sales of intermediate outputs of industry } j}{\text{total output of industry } j}$$

He calculates the coefficients on a national and on a regional basis. Containing a number of very interesting ideas, and correctly stressing the importance of political factors and the structural effects of projects (especially when they are as large as co-operation projects are likely to be), Gilbert's methodology is less satisfactory as far as the evaluation of the direct efficiency of the projects is concerned.

D. Kendrick [36], on the other hand, disregards political aspects and indirect effects. He focuses on the optimal allocation of the projects, aiming at cost-minimization. Although the empirical part of his model is concerned only with the location of the Brazilian steel industry, he attempts to solve the problem of allocation under an integration scheme. His interest lies mainly with the technical-mathematical aspects, in particular with the ways of solving a mixed-integer programming problem. He assumes fixed scale of output, considers the techniques of production given, and minimizes a total cost function, subject to a capacity constraint and a market requirements constraint. Transport costs are fully considered in the model and play a major role in the determination of the optimal location.

H. C. Bos and J. L. Enos rely on Kendrick's model, but modify a number of important assumptions. They make the scale of operation variable, consider alternative techniques of production, and introduce explicitly political constraints. They do not attempt, however, to incorporate indirect effects into the analysis: they want to obtain the package of projects that produces the maximum direct effect. The size of their mixed-integer programming problem is too large, however, to be used in normal circumstances (i.e. within normal research budgets) ([9], pp. 118-141 and p. 143).

The main problem that arises in the above-mentioned programming models is that economies of scale do occur, making the use of linear-programming models impossible. The mixed-integer programming technique that has to be used lacks the elegant simplicity of the linear-programming model and needs larger computing facilities. As we do not intend to develop a programming model, we do not go further into this matter, and refer to a recent survey of the problems associated with planning with economies of scale, published by L. Westphal [86].

Selecting economic co-operation projects would, of course, be much simpler if it could be carried out on a micro-economic level. Here we can quote H. Kitamaura's view [37] that, although regional policy should ideally be as extensive as national plans, the simplest pragmatic approach consists of promoting and financing a few specific industrial projects that represent new investment in the regional market. Conventionally, great confidence is placed in micro-planning techniques based on

cost-benefit analysis. Their alleged capacity to select appropriate projects stems from theoretical properties. If a number of conditions are fulfilled, the same results can theoretically be obtained by selecting projects, using cost-benefit analysis, as by applying overall macro-planning models. Their obvious advantage is simplicity of application. The validity of the procedure hinges on the possibility of introducing into the analysis of the individual projects their effects on the rest of the economy. Moreover, the procedure of micro-planning raises also the problem of computation, although not in the same way as the general or partial equilibrium models. In order to give the same results as the macro-model, the project-appraisal approach should look at the same number of projects, each project being defined by a product, a technique for producing it, a location of the plant, and a phasing of investment and production. The feasibility of the procedure, therefore, depends to a large extent on the efficiency of eliminating uninteresting projects.

The few articles that deal with co-operation projects are, however, not very helpful in this respect. D. W. Baerresen [3] makes a number of interesting points, but his approach is limited because he analyses only the optimal location and size of units producing a particular product as a function of consumption (= output) maximization. He also introduces different techniques of production and transport costing in the participating countries, but fails to deal with the political aspects of the problem, the development objectives, and the distribution of costs and benefits. This last aspect is analysed in an article by R. Robson [56]. Following a suggestion by I. M. D. Little [39] about equity participation of different countries in the co-operation project, he works out how a satisfactory distribution can be reached by combining a location with particular equity participation schemes. Other aspects of the evaluation procedure are not treated explicitly. Both Baerresen and Robson fail to give an answer to the most important question: how can we be sure that the solution obtained by micro-planning presents the same characteristics of optimality as the programming solution; in particular how can we be sure that the projects discarded from analysis (i.e. techniques or locations that are eliminated) are less efficient than the ones considered.

The models we surveyed in the preceding paragraphs illustrate the complexities of regional investment planning and indicate the problems that arise if we try to integrate all the relevant aspects of co-operation projects in the analysis. No model could deal with all the aspects at the same time and remain soluble by existing programming algorithms. The main advantage of the mathematical programming approach is that a wide range of projects can be covered. By considering for each production unit a number of possible techniques and locations, the chances that an interesting project has been overlooked becomes minimal. The approach runs, however, into (presently) insuperable calculational problems when economies of scale and indirect effects are introduced into the analysis. This is a fundamental weakness, because the large size of co-operation projects makes the occurrence of both economies of scale and indirect effects important. An adequate methodology of selecting co-operation projects must be able to deal efficiently with those two effects while at the same time retaining as wide a coverage of projects as necessary.

At first sight this might seem impossible. The key to the solution lies, however, in the removal of another weakness of the mathematical models: their mechanistic character and their incapacity to take political preferences and options into account. Although H. C. Bos and J. L. Enos [9] introduce political elements into the model, they do it in a negative way (as a constraint on the feasibility of the solutions). The introduction of the political factor in a positive manner will make it possible to combine the wide coverage of possibilities with an adequate in-depth analysis of the interesting projects. The optimality we want to achieve is strictly determined in

political terms. Therefore, the procedure of the analysis (the way in which planners and policy makers have to collaborate) becomes as important as the purely technical aspects of the calculations.

### *Procedure*

The procedure of analysis and selection is conceived in such a way as to make it possible to find a solution to the basic political problem of co-operation: how the conflicting national interests can be reconciled at a regional level. Industrial co-operation implies potential gains and losses. For each individual project and for the scheme as a whole, the participating Governments will carefully compare the positive and the negative aspects. *A priori*, every country is a possible candidate for the establishment of every industry. The natural question a Government will ask when faced with the demand to sign a purchasing agreement is: what the losses are, or—in other words—what the gains would be if the industry was set up nationally. This is the question that has to be answered in the last phase of the procedure, when the Governments attempt during the negotiations to construct a feasible co-operation package. Before regional decision making is possible, a series of steps of national decision making must be gone through, making it possible to limit the number of production units to be considered for each country, and to determine for each product the best technique of production and the best location.

The CPT has to start working on the results of the identification phase. The series of possible co-operation products, each with a number of alternative techniques of production, must be presented to the Governments. On the basis of the direct effects of the projects, the Governments are asked to make a tentative choice of the projects that they are interested in, the technique of production they consider most suitable and the location(s) they prefer. As the CPT can form its own opinion on this matter, this need not be a one-way process. A dialogue has to develop between national Governments and the CPT; in the process of combining economic analysis with political options, a small number of projects has to be selected. To simplify the calculations, this first selection is based on the direct effects only, and on a rough test of the capacity of the project to generate indirect effects. The effects of economies of scale are taken into account.

This preliminary selection makes it possible to subject the chosen projects to a detailed analysis. The indirect effects have to be incorporated into the analysis, and the introduction of transport costs makes it possible to compare the different possible locations in the country. Each Government gets the information on its projects and, in collaboration with the CPT, makes a further choice of best national projects. These sets of best national choices will be confronted in the regional negotiations, where the best regional projects have to be selected and a feasible co-operation package constructed.

In order to permit the necessary permanent dialogue between the CPT and national Governments, the analysis has to be conceived in such a way that the information can be provided that policy makers consider relevant. Governments will look further than the direct effects of the project in its strict definition, and will be interested in the efficiency of the project, not only in reducing cost but also in achieving other development objectives. Therefore an adequate analysis of co-operation projects must take into account indirect effects as well as multiple development objectives.

While the best national projects are being decided, national development objectives prevail. Basing the choice on national, rather than regional criteria is

warranted not only because of the political fact that national sovereignty exists. It can also be argued on economic grounds, because it makes it possible to minimize the risk associated with co-operation. Even though this principle would imply sub-optimality in a world of perfect certainty, it is preferable to rely on it in a situation of uncertainty. When the co-operation agreement ends or when it is broken by one or several members, and a country finds itself with a production unit that cannot produce efficiently for the national market, the losses will be lowest if the project conforms as closely as possible to the national development priorities. If those priorities had been given up in order to conform to regional criteria, the losses would undoubtedly be larger.

The effects of projects on the national interests remains the criterion to be used during the last phase of the procedure, when projects are compared and selected on a regional basis. Trying to select projects on the basis of regional criteria would imply that regional development aims can be defined. As no regional interest exists independently of national interest, costs and benefits of alternative courses of action on the regional level still have to be measured against national development objectives. The methodology must provide the instruments to carry out this comparison effectively.

One more remark must be added about the standards of comparison, or relevant alternatives, used in the different phases of the analysis. The efficiency of a project can be evaluated only if it can be compared with an alternative course of action. In the first phase of the analysis, when the best national projects are selected, the different projects for producing a particular product are compared with each other and with the case of no national production. By comparison with each other, the projects can be ranked according to decreasing efficiency; by comparison with the case of no domestic production, a decision can be made on whether it is worthwhile to consider the project any further. The case of no domestic production can be split up into two components: imports of the product to satisfy national demand (cost calculated at c.i.f. prices), and the investment of the capital outlay necessary for the co-operation project elsewhere in the economy. If, for a given product, the best co-operation project generates lower total gains than the alternative, it would be unwise to insist on keeping the project in the list to be submitted for regional negotiation.

In the second stage of the analysis, when projects are compared at a regional level, the same principle for defining the alternative remains. The alternative source of supply of the product is no longer imports from the world market, however, but imports from a partner. Two more elements have, therefore, to be taken into account: the compensations offered and those received. A country competing for the establishment of the project will have to offer its partners better conditions than those that could be obtained on the world market. We will assume that these better conditions take the form of a budget-to-budget subsidy calculated on the basis of the quantity imported. A country eager to establish the project on its own territory will have to look at its net gain and decide to what extent it is willing to share this gain with its partners.

The optimal project will be the one on the basis of whose net gain the highest compensation can be offered. The fact that the compensation can be offered does not necessarily imply that it will in fact be offered during the bargaining process. It is possible that a far from optimal project may be chosen because the Government concerned decides to share the whole net gain with its partners, whereas other Governments do not. It will, moreover, be necessary to depart from the economically optimal solution to arrive at some politically feasible distribution of projects. Here

also the alternatives have to be examined carefully, so that a pattern of distribution can be found that involves a minimum loss for the participating countries.

The main aim of the methodology for evaluating co-operation projects is to provide a useful tool to assist the political decision-making process. The procedure outlined in this section suggests a way in which analysis and decision making can be articulated during the various phases. By fitting the methodology as closely as possible to the political process, we tried to avoid the main weakness of many planning methodologies, which often conceive planning as a technical exercise, that permits the planners to obtain objectively defined optimal solutions in which political decisions—play no, or only a minor, role.

### *Assumptions*

Six main assumptions underlie the analysis. The first three are the usual ones formulated when discussing planning in developing economies.[2] The last three are introduced only to simplify the exposition of the methodology. Their removal does not fundamentally alter the approach suggested. The assumptions are:

*(a)* The economies of the participating countries are not homogeneous. There exist, side by side, modern and traditional techniques of production and social relations in both rural and urban areas. In the traditional (subsistence) rural and (informal) urban sector the labour force is not fully employed. Because there is unemployment and also underemployment, the opportunity cost of labour is not equal to the market wage;

*(b)* The social rate of discount (expressing how many units of future consumption are judged equivalent to one unit of consumption today) is lower than the social marginal return on investment (indicating how many additional units of future consumption can be obtained by giving up one unit of consumption today). This is reflected in the sub-optimality of the savings rate and the fact that the opportunity cost of capital is not equal to the interest rate;

*(c)* A balance of payments problem exists, because of the undervaluation of foreign currencies in relation to the domestic currency. A complex system of import tariffs and quotas and export subsidies is necessary to maintain equilibrium. This implies that the opportunity cost of foreign exchange is not equal to the foreign exchange rate;

*(d)* The whole surplus generated by the project accrues to the Government of the country where it is located, which reinvests the whole amount (surplus is defined as the total sales, less the cost of production, including depreciation allowances, but excluding financial cost);

*(e)* The way in which the project will be financed is not determined in advance and does not have to be taken into account while the effects of the project are being analysed. It is assumed that for a "good" project, obtaining the necessary finance in the appropriate form is not a problem;

*(f)* The only way of compensating partner Governments is the payment of a budget-to-budget subsidy calculated according to the quantities of the co-operation project's output purchased.

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[2] For a more complete analysis of these characteristics of most developing economies and their implications for project evaluation, see *Guidelines for Project Evaluation* [24], especially chapters 13-16.

### *Development objectives*

In the evaluation of projects, the development strategy, as formulated in the development plan, is of crucial importance. To evaluate a project is to measure its efficiency in achieving certain objectives. The development strategy determines what the aims are, implying what kind of effects are expected of projects. When the relevant effects of the projects have been analysed, the evaluation of the overall efficiency of the project is only possible if weights are determined that express the relative importance of the different development aims. A multitude of policy aims can be put forward, but we chose to concentrate on three: cost reduction, foreign exchange gains and employment creation. While developing the methodology in the next section, we mention the regional development aim and show how it can be introduced into the evaluation. As it complicates considerably the calculations, we do not use it in our methodology. The choice of the development objectives and their use in the analysis is inspired by the treatment of multiple development objectives in the UNIDO *Guidelines* (P. Dasgupta, S. Marglin and A. Sen [24]). Because of the limited size of this paper, our discussion of the various objectives must necessarily remain superficial, and we refer to the *Guidelines* for deeper analysis.

The most obvious objective is cost reduction or surplus maximization. We assumed that the Government is in full control of the project and that the whole surplus accrues to it in the form of taxes or profits. The way in which the project is financed is to be determined during the implementation stage and it does not affect the calculation of the total gains at the earlier stages of the analysis (cf. assumptions *(d)* and *(e)*). Unlike national development planning, the evaluation of co-operation projects is not an exercise in maximizing consumer welfare. The level of welfare to be attained is fixed in the national development plans, and is reflected in the prices the Governments have fixed for the co-operation products. The aim of co-operation is cost reduction, that is, to help attain the predetermined levels of welfare at minimum cost. The minimum cost corresponds with a maximum surplus accruing to the Government. The surplus the Government gets is "investible" and will be considered for the whole amount as an addition to the government investment fund. Whether it will be invested or consumed is a decision the Government will have to take once it gets the income and according to its priorities at that moment. As a unit of investment is more valuable than a unit of consumption (assumption *(b)*), we assume that the Government puts the money to its best use: investment.

A second objective of the Government is to earn foreign exchange. The reasons for this are twofold. In the first place, foreign exchange is a scarce good, and its opportunity cost is higher than the market exchange rate indicates. A special premium will therefore be placed on any additional foreign exchange earned. In the second place, national economic independence can be a separate objective of economic policy. Replacing imports by local production and saving foreign exchange means a reinforcement of the international economic position and a reduction in dependence on the industrialized countries. The amount of foreign exchange gained by the project is equal to the generation of domestic value added.

The third objective is the creation of employment or the distribution of income. This objective has an economic as well as a social meaning. The opportunity cost of labour is lower than the market wage rate or, in other words, the creation of jobs in the modern sector implies either the productive use of formerly unutilized resources, or the shift of labour from low to high-productivity employment. From the social point of view, the creation of jobs gives people the chance to earn a decent living and contributes to the improvement of the distribution of income. The effect can be

measured by the number of jobs created. If necessary, a distinction can be made according to the different categories of workers.

As indicated in section I one of the main reasons why Governements have a strong preference for industrial development is that external effects are generated in the process of industrialization. Through the linkages that exist in the industrial structure, these effects stimulate the development of other sectors. In order to get a correct idea of the projects' contribution to the industrialization objective, these external effects have to be taken into account in the analysis. We introduce the preference for industrialization as an extension of the scope of the analysis rather than a separate objective. The methodology must make it possible to calculate the *total* rather than merely the direct effects of the project. We will necessarily have to leave vaguer aspects of the industrialization objective (e.g. the creation of an industrial climate) outside the analysis.

### *Analysis of effects*

In the previous paragraphs we discussed the aspects of the development strategy relevant to the evaluation of projects. Starting from the development aims, we now have to define which effects of the projects are important and determine how they have to be measured. The important effects are those that correspond to the aims we set aside: a project's capacity to generate investible surplus, to earn or save foreign exchange and to create employment. We also stressed that the study must not be limited to the direct effects. Secondary effects throughout the economic structure must be taken into account so as to provide a complete picture of the project's effectiveness in achieving development aims. In order to relate our approach to existing methodologies for project appraisal, we shall briefly examine alternative ways of dealing with the problem of indirect effects.

The main class of external effects (those that may be called backward linkages or indirect effects) is the result of the purchase of inputs on the domestic market. By buying locally, the project profits from the high productivity sectors that can supply the inputs needed at low prices. At the same time, it loses when it has to pay high prices for inputs from inefficiently functioning protected industries. Not only is the profitability of the project affected by the productivity elsewhere in the economy; the project's domestic purchases of inputs also affect production conditions in the rest of the economy. An industry that was functioning below capacity before the project was introduced will be able to increase its profitability. By adding to the demand for a domestic input that is already in short supply, the effect of the project can be to push prices further up, or to make new investment worthwhile.

These effects of the project on the rest of the economy (and vice versa) can be taken into account in several ways. The first, advocated by most project analysis theorists, is the use of shadow prices. This is a set of theoretical prices, calculated according to a series of consistent principles of how cost and benefits from the point of view of the national economy should be defined. The best known variants are the Little-Mirrlees (LM) procedure, which is a rewritten version of the OECD *Manual* [40] and the UNIDO *Guidelines*. Although different in a number of respects, the two approaches are basically very similar, as has been demonstrated by P. Dasgupta [24] and I. Little and J. Mirrlees [41], pp. 358-362. Other authors have criticized the use of shadow prices and have suggested analysing indirect effects by looking at how the implementation of the project affects the structure of the economy (C. Prou and M. Chervel [52]; R. Olivier [29]; M. Chervel [19]; M. Chervel, M. Courel, D. Perreau [19]).

In our opinion, the use of shadow prices for project appraisal in general, and for evaluating co-operation projects in particular, raises a number of problems. Theoretically, the calculation of shadow prices requires the specification of an objective function (determined by the policy objectives) and a set of constraints (representing the structure of the national economy). Obviously, shadow prices are rarely calculated in this way, and some more practical approaches have been defined. As C. Prou and M. Chervel have pointed out, the use of these practical shadow prices often depends on a number of implicit assumptions. The calculation and the use of shadow prices often places the planners in a position where they are forced to assume the policy-makers' role and introduce their own value judgements into the analysis. The same problem has been raised by A. Sen [60] who shows how the use of shadow prices, in particular of the Little-Mirrlees type, implies some rather strong assumptions about the planners' area of control. Calculating shadow prices is not only a question of "knowing what is the sensible policy in the related fields, but also being able to ensure that these policies will in fact be chosen" [60], p. 490. Even if all assumptions are clearly stated, and all value judgements made by the politicians, the results of an analysis using shadow prices is difficult to interpret for someone who is not familiar with equilibrium models. We fear that for the people who have to make the decisions, the use of shadow prices may hide more that it will reveal about the effects of the projects analysed.

Shadow price methods rely on the assumption of the allocative efficiency of real or imaginary markets. When dealing with indirect effects, the question is asked: how would this effect manifest itself in price terms if markets functioned perfectly and optimal policies were pursued? For the reasons stated in the preceding paragraph, we shall try to avoid the use of shadow prices for domestic inputs or for primary factors of production. Instead, we shall analyse directly the effects of the project on the production conditions in the other sectors of the economy. In order to make this analysis possible, we will reformulate the project in the form of a cluster that groups the core project we are studying and the supplying domestic sectors. We shall first discuss the concept of clusters and then turn to the problem of pricing.

### *Project clusters*

The meaning of cluster can best be approached by referring to J. Tinbergen's "International Industries" [67]. International industries are those whose products can be exported and imported. The concept is an approximative one because, in reality, there is a continuum of products with increasing transport costs. The concept can be refined by introducing a qualitative aspect: international industries are basic or "pushing" industries that play a key role in the industrialization process. A number of national sectors are related to the international sector. These national (or regional) sectors supply part of the inputs of the international industry, and are closely linked with it. The expansion of an international industry necessarily entails the expansion of the output of the national industries linked to it. To maintain a demand/supply balance in the national industries, projects for such industries have to be planned together with the establishment of international industries.

The same is not true for the different international industries. There is no technological need to link them, although the balanced growth of a number of international industries together can be essential from the point of view of maximizing linkage effects. But, by definition, the outputs of international industries can always be bought and sold on the world market; so domestic production is not for them. Additional policy decisions are necessary to establish two international

industries in conjunction. The role of the development strategy is to determine how to exploit these junctions optimally, in order to achieve a fully integrated and efficient industrialization process. The construction of an industrial sector can be planned by analysing project clusters around different international industries, focusing on the linkages.

J. Tinbergen's semi-input-output method provides a tool to describe theoretically and to analyse empirically the balanced expansion of the national and international industries in the cluster ([22], [23], [51], [58], [67] and [68]). The method enables us to interiorize in the projects a lot of the indirect effects that are often difficult to deal with. When, for example, the core project will increase the profitability of an already existing power plant by eliminating its underutilization of equipment, the effect will show in the accounts of the cluster. We can summarize the principles of the method in the following simplified presentation by P. Cornelisse and C. Tilanus [22], pp. 526-528. Interpreting all the variables in terms of changes, we can write the input-output relations:

$$\mathbf{X} = Z + \mathbf{F}$$

where:

**X** is the vector of total output,
Z is the matrix of intermediate demand,
**F** is the vector of final demand,

or:

$$\mathbf{X} = A\mathbf{X} + \mathbf{F}$$

where A is the matrix of technical coefficients.

Partitioning into international and national sectors, we can write:

$$\begin{bmatrix} \mathbf{X}_f \\ \mathbf{X}_n \end{bmatrix} = \begin{bmatrix} Z_f \\ Z_n \end{bmatrix} + \begin{bmatrix} \mathbf{F}_f \\ \mathbf{F}_n \end{bmatrix}$$

The assumption of the semi-input-output method is that the increased need for international intermediate products is zero. The increase in the output of the international sector is therefore equal to the increase in final deliveries of that sector. The increased need for international intermediate products is satisfied through imports. The $A_f$ part of the matrix of technical coefficients is summed by column and added to the original vector of marginal import coefficients. The increase in total output of the national sectors can be written:

$$\mathbf{X}_n = \begin{bmatrix} A_{nf} & A_{nn} \end{bmatrix} \begin{bmatrix} \mathbf{X}_f \\ \mathbf{X}_n \end{bmatrix} + \mathbf{F}_n$$

where nf denotes a supply of national sectors to international sectors, and nn a supply of national sectors to national sectors. Rearranging the terms and assuming that no autonomous increase in the demand for the output of the national sector takes place, we can write the total increase necessary in the output of the national sectors, caused by an increase in the production of the international sector:

$$\mathbf{X}_n = (I - A_{nn})^{-1} A_{nf} \mathbf{F}_f$$

where $A_{nf}F_f$ is the direct increase in demand of the international sector for inputs produced by the national sectors. The increase in output of national sectors can be broken up into three parts which are relevant for our purposes:

Additional imports: $M X_n$

where M is a vector or a matrix of marginal import coefficients.

Additional employment: $L X_n$

where L is a vector of labour coefficients.

Additional surplus: $(V\text{-}WL) X_n$

where V is the vector of value added coefficients, and $W$ the wage (scalar).

In our methodology, we shall enlarge the national sector concept and treat industries producing "international" inputs locally in conditions of less than full capacity utilization in the same way. If the production capacity of those international industries is fully utilized, we shall adopt the usual assumption that the inputs are imported at world market prices. For every international project that requires investment, a separate cluster is formulated. A cluster sequence is then an articulation of a series of related projects in which each project buys inputs from the preceding one. The optimization problem that we are dealing with will have to determine the best location and technique of production of the individual clusters, and also the optimum cluster sequence.

Until now, we have considered only the indirect effects or backward linkages, but what about the other external effects? Forward linkages may be an important part of the desired impact of a project, especially for basic industries (although not in our case). Through the forward linkage, a project affects the sectors buying its output and using it as an input. The linkage is transmitted through the market mechanism and, although non-price factors can be important (e.g. assurance of a steady supply of the input), the cheapening of the input conveys the larger part of the effect. As in our methodology, the prices at which the outputs are sold are fixed in advance and no linkage occurs. Our methodology aims at minimizing the cost of attaining a predetermined welfare (price) level, and the surplus that could possibly have been transmitted to purchasing sectors by selling at lower prices shows in the cluster.

The spill-over effects of the project may be very important, especially when large projects are concerned and social investments have to be undertaken. Only to the extent that the effects can be given a meaningful monetary expression should they be added to the consolidated account of the cluster. Often this is not the case, which does not imply that the effects are irrelevant from a policy point of view. Like the creation of an industrial climate, they will have to be taken into account directly by the policy makers in the final evaluation of the project.

Secondary effects are defined as the additional consumption spending that results from the distribution of income in the cluster, and its impact on the production of consumer goods and on imports. They are associated with the concept of the Keynesian consumption multiplier. These effects are basically the same for all projects. It might be necessary to give them some explicit attention in two cases. Firstly, if the employment composition of different projects is very different, we can distinguish between expatriates, local management, local skilled and local unskilled workers. As the consumption pattern of the groups will be different, the effect on the local consumption goods industry and on the volume of imports will not be the same. Secondly, the location of a project will affect the secondary effects, because part of the consumption goods are supplied locally. If the secondary effects of

projects, for the above-mentioned reasons, are very different, they should be taken fully into account. They are less easy to deal with than indirect effects, because they are based on behavioural rather than technical parameters. We shall therefore not attempt to take them into account separately, but they will be taken into consideration in a general way when the appropriate coefficient to weight the income distributed by the project is being fixed.

One additional remark should be made about cluster sequences. As pointed out before, if a production unit can be split up into a number of separate processes that can be located in different places, a cluster should be built up around each of the separate projects and their effects should be considered individually. All the alternative ways in which the clusters can be linked together have to be examined, and the sequence should be chosen that produces the largest overall effect. In our framework we can analyse the indirect effects of co-operation projects on existing industries and the effects of co-operation projects on each other when they are linked in a cluster sequence. The indirect effects of unlinked co-operation projects on each other can be incorporated into the analysis only by examining one by one all the possible relations between the various projects. This is undoubtedly a weak point in the methodology.

### *Pricing*

The results of the analysis depend not only on the effects indicated but also on the prices used to evaluate them. The prices of the outputs are fixed by the political authorities (reflecting the level of welfare that has to be attained) and present no problem. Giving a good evaluation of the value of the inputs is, however, a more difficult task. The price fixed must have a meaning for the people that have to interpret the results of the analysis, and—particularly in the case of co-operation projects where several Governments are involved—the price chosen must be above dispute. The problem is more difficult for domestic than for internationally traded products.

Analysing the co-operation projects in terms of clusters makes it possible to avoid the use of either market or shadow prices for domestic products. Market prices of purely domestic inputs often do not reflect real costs, and it would be incorrect to make the co-operation project suffer or profit from those prices. The shadow prices of these inputs are not easy to calculate and it is not always clear what assumptions they really reflect. The same remarks are valid for domestically produced international goods supplied by industries working below capacity. The analysis by the semi-input-output method summarizes the indirect effects under convenient headings: additional imports, additional employment (= distribution of income), and additional surplus. If the production of domestic inputs necessitates additional investment, the cost of the capital outlay has to be summed with the investment for the core project itself. The sales of products or services of that national project outside the cluster can be added to the benefits of the cluster.

The value of all the international inputs and outputs used in projects will, in the first instance, be measured in world market prices. This is the cost at which these products would have to be bought if there were no production in the region. The prices to be used are not current world market prices, but prices that can be calculated using informed guesses of how world demand and supply of the products concerned will evolve in the future. World market prices for outputs, while representing the opportunity cost, do not however reflect the revenue the project will derive from selling its output. As was stressed in the section on identification, the Governments have to decide the level of the prices at which the co-operation

products will be sold. This is particularly important for products that have a high price elasticity of demand, and products that the Governments plan to promote in the near future (use of fertilizer in agricultural development campaigns, for example). We therefore calculate the revenue of the project using the prices fixed by the authorities, introducing afterwards, while calculating the net gain, the difference between fixed domestic price and world market cost.

Building up a cluster sequence will normally add nothing to the efficiency of the individual clusters. The total gains are simply added and the internal pricing in the cluster sequence will only determine in which part of the cluster the benefits will show. Cost reduction is possible, however, if the sequence makes it possible to pool the investment necessary in the national industries to supply the additional inputs.

The cost of both skilled and unskilled labour will be expressed in terms of the market wage rate. This is the cost the project effectively has to pay for the labour services and it diminishes the investible surplus in the hands of the Government. The use of a shadow wage rate is usually advocated on the basis of two arguments. Firstly, the opportunity cost of labour is said to be lower than the ruling wage rate. This is probably true in situations where unemployment and underemployment prevail. There might be a net gain from the view of the national economy, as labour is shifted from the agricultural sector to industry: total production (and consumption) goes up without an increase in the total number of hours worked. If all the assumptions underlying this argument are accepted, the increase in production will be absorbed by an increase in consumption by the workers transferred to industry (wage less former consumption) and in the consumption of the peasants staying behind (consumption of the migrants less their marginal product). Unless the Government can make this increase in consumption flow into its own treasury by taking it away, total investible surplus will not be affected. As our first aim is to maximize the surplus, expressed in domestic investment units accruing to the Government, the market wage has to be used in the calculation. The effects of job creation and distribution of income will be introduced separately into the evaluation of the total gain.

Secondly, an argument is put forward saying that the payment of wages diminishes the investible surplus, and, since a unit of investment is more valuable than a unit of consumption, this should be reflected in the shadow wage rate. In order not to complicate the calculation of the surplus, we prefer to group all the effects of the creation of employment together and introduce them into the analysis by adding a term to the total gain function. The weighting coefficient to be used should reflect the balance of the Government's "net" preference for job creation and income distribution.

### *Comparison of effects over time*

Instead of relying on present-value calculations for comparing the effects of the project occurring at different moments in time, we shall directly compare the net gains in a limited number of years. We are aware that we lose most of the nice theoretical properties of the methodologies based on discounting techniques, but we feel that we gain by making the calculation simpler and the result directly usable in the political decision-making process. As far as the losses are concerned, two arguments in favour of discounting methods have to be examined. The main function of discounting is to introduce into the analysis the opportunity cost of capital and to take into account the differences in the shape of the time profile of costs and benefits of the different projects. First, in our methodology, the opportunity cost of capital is introduced into the analysis by calculating the net gain of the project, i.e.

by subtracting from the total gain of the project the total gain that could be obtained by investing in an alternative project a sum equal to the total capital outlay of the co-operation project. This difference measures the extent to which investment in the co-operation project is more efficient than investment elsewhere in the economy.

We feel that the error made by not considering the exact time profile is not very important. For reasons described above, the size of the project is *a priori* limited to a rather narrow range. No projects are considered for which efficient small-scale production techniques exist, and projects that are too large are equally discarded. For the projects within the accepted range, we may assume that the time profile of costs and benefits will be quite similar and present the following features:

| | |
|---|---|
| Year 1-year 3: | Evaluation, selection, decision, planning of implementation |
| Year 4-year 5: | Investment and first production trial runs |
| Year 6: | First year of operation |
| Year 8: | Normal operational efficiency |
| Year 10: | End of the agreement |

The projects that we are comparing produce the same product for the same market at the same price. Differences in effects must therefore be caused by differences in cost. As the projects are roughly of the same size, enough information can be obtained for our purposes by looking at the investment cost, the results of year 6 and the results of year 10.

A difficult problem arises, however, at the end of the agreement. What happens after year 10 is highly uncertain, for political and economic reasons. Extrapolations of demand or of cost of production will not be very accurate for the distant future. More importantly, it is by no means certain that the project will continue to produce for the integrated market, as one or more countries may withdraw to set up their own industries. This kind of uncertainty is difficult to incorporate into the analysis because it does not depend in the first place on states of nature or economic evolution, but on the political decisions of other Governments. Trying to estimate the probability of withdrawal would imply estimations of the potential benefit of national production and the costs of possible retaliation, and it is evident that those comparisons are too speculative to be of any use. A more relevant approach seems to be to define the possible patterns of withdrawal, to calculate the losses associated with each case, and to estimate the possibilities of expanding the exports to third countries. On the basis of this information, the policy makers have to decide how much risk they are willing to run, and how probable they think the various patterns of withdrawal are. Rather than giving a criterion for ranking the projects, this decision will make it possible to eliminate some unacceptable projects.

The main advantage of not using discounting techniques is that the procedure for selecting the best regional project becomes simpler. In our methodology, the units in which the gains are expressed are different for each country. The units depend in particular on the importance attached to the development objectives (see next section). The way in which the different projects can be compared is by calculating the maximum compensation a country is able to offer for obtaining the project. By studying the effects in year 6 and year 10, the minimum and the maximum compensation a country is able to offer can be calculated. A correct estimation of the possible compensation in years 7, 8 and 9 would not contribute much to the accuracy of the results. Discounting would only complicate the matter and would in any case give a net gain indicator that would not be comparable between countries and would be unfit for use in negotiations on possible price compensations.

### *Calculation of total effects*

In order to arrive at the overall effect of the project, the various effects (contributions to achievement of development aims) have to be added up, after having been weighted by the appropriate coefficients. These coefficients express the importance the Governments attach to the objectives. As these weights are different for each country, the indicators of national total gain are not directly comparable. The coefficients that we use bear some resemblance to those used in the UNIDO *Guidelines* /[24], especially chapters 14-16).

There is one important distinction to be made however: the UNIDO *Guidelines* measure the effects of projects in units of domestic consumption, whereas we use units of domestic investment. The surplus we calculate expresses the investible funds in the hands of the Government. This surplus, therefore, need not be weighted and can be introduced as such into the total gain equation.

As we discussed above, the Government may attach to the earnings of foreign exchange premiums above the market rate of exchange for two reasons: the national currency may be over-valued, and national economic independence can be an end in itself. The coefficient $\phi$ is the factor by which the earnings of foreign exchange exceed their market price, in the opinion of the Government. Foreign exchange gains calculated at the market price are already taken into account in the calculation of the surplus; so only the premium earned over the market rate has to be added separately into the total gain function.

The creation of employment has various positive and negative aspects. On the positive side, the creation of employment makes it possible to increase consumption, since the opportunity cost of labour is lower than the market wage rate. If the Government does not tax the consumption gain, that gain will accrue partly to the workers remaining in the rural sector and partly to the workers who get the new jobs. A second positive effect is the increased demand for domestic consumer goods (secondary effect). On the negative side, the payment of wages diminishes the investible surplus, and since a unit of investment is more valuable than a unit of consumption, a cost has to be taken into account: a shadow price of consumption that the inverse of UNIDO's shadow price of investment has to be calculated. All these effects have to be balanced against each other and a weighting coefficient $\lambda$, expressing the Government's net preference for employment creation, has to be calculated. The total additional distribution of income has to be multiplied by the coefficient and added to the total gain function.

We can conclude that the total gain of the project, measured in terms of public investment units, is equal to the investible surplus, plus $\phi$ times the foreign exchange gain, plus $\lambda$ times the additional distributed income. This total gain has to be compared with the gain associated with an alternative utilization of the investment funds. We therefore estimate how much investible surplus, foreign exchange gains and additional employment new projects in the economy are likely to generate. Weighting the different elements suitably, and dividing by the capital outlay, we obtain an average gain of alternative investment that can be used as a standard of comparison to calculate the net gains of the co-operation projects. This net gain can be shared with the partners and distributed, e.g. in the form of budget-to-budget subsidies. In the following section we show how the net gain and the maximum potential compensation (based on the net gain) can be calculated. In the last section we indicate how this compensation can serve as a criterion for selecting the most efficient co-operation package.

The parameters used in this section are derived from the Government's preference function. How such a derivation can be made is shown in the UNIDO *Guidelines.* Although our parameters are not the same as those used in the *Guidelines,* the same method of determining the foreign exchange and income distribution coefficient can be used. We assume that the parameters can be derived on the basis of the development plan and past economic policy decisions. If this is not the case, the collaboration of planners and politicians and the preferences expressed by the policy makers while eliminating and ranking projects in the preliminary phases of the analysis will make this estimation possible.

## IV. Methodology

### *Introduction*

In this section, we intend to show how, by progressive elimination, we can reduce the large number of identified projects to a set of selected best national projects that will have to be compared later with the projects selected in the other countries. In order to make the exposition of the step-by-step method easier, we briefly discuss in the following two sections the characteristics of the production and transport cost functions that will be used in the analysis.

The phase of preliminary selection gives the Governments the opportunity to express their preferences on the basis of the information about the direct effects of the projects prepared by the CPT. The second phase of detailed analysis permits the introduction of direct effects and transport costs into the analysis. This will give the decision makers a complete picture of the possible effects of the different projects and enable them to select in a well-informed way the project that corresponds best to the country's economic characteristics and the politicians' development objectives. The net gain calculated for each project indicates the extent to which the project is more efficient than alternative national investment in achieving the development aims. This net national gain will be used as the basis of the calculations necessary to compare the projects at a regional level. We repeat that the "gain" is equal to the surplus accruing to the Government increased by the premium earned on foreign exchange and the net welfare value of additional distributed income, all elements expressed in terms of domestic investment units.

In the collaboration between planners and Governments, the role of the former is not strictly limited to the communication of technical information. On the basis of the development plan and of the Government's past and present decisions, the planners can determine the values of the weights attached to the various development objectives. This enables them to anticipate the politicians' decisions and, by provoking a discussion about the consistency or inconsistency of certain choices, to get a clearer idea of the Government's preferences and of possible other effects that have to be taken into consideration in the selection of projects.

### *Characteristics of the techniques of production*

Each production technique is characterized by an initial capital outlay and by the transformation of given quantities of inputs into a quantity of output. Techniques can differ in the amount of initial investment needed, the number and the kind of jobs that are created, and the relative quantities of raw materials, energy and other inputs used.

Investment, like production, has a number of economic effects that have to be examined. Investment necessitates the purchase of imported or locally produced equipment and construction material. It can be broadly divided into construction costs and purchase of equipment. Both components can be further subdivided into purchase of domestically produced inputs, direct imports of inputs and direct employment of labour. The direct cost from the point of view of the Government will be the total investment cost. To calculate the real social cost of the investment, we shall have to take into account the indirect effects created by the increased output of the domestic industry (see section on the detailed analysis of indirect effects below).

When the structure of production is analysed, the various inputs can be divided according to two criteria. The first criterion is whether or not the quantity of inputs needed varies with the amount of output produced:

*(a)* Fixed inputs (FI) that are always necessary in the same amount, irrespective of the quantity produced;

*(b)* Variable inputs (VI) for which the quantity needed depends on the level of production.

The second criterion is that used in the preceding paragraph, and divides the inputs according to their origin:

*(a)* Imported commodities for which no local source of supply exists. We also include the international products that are produced locally but are in short supply (see section III, discussion of project clusters);

*(b)* Domestic products include the products and services that by their nature cannot be imported or exported, and the domestically produced international products for which excess capacity exists;

*(c)* Primary factor of production: labour, land and capital. We shall consider only labour, as the remuneration for the other factors (rent, interest and profit) is supposed to accrue to the Government in the form of surplus.

We assume that the cost function of all the techniques of production has the following simple form:

$$TC = FC + VC - Q$$

so:

$$TAC = \frac{FC}{Q} + VC$$

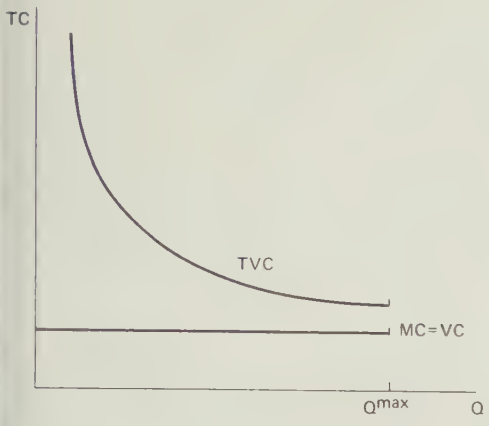
$$MC = VC$$

where:

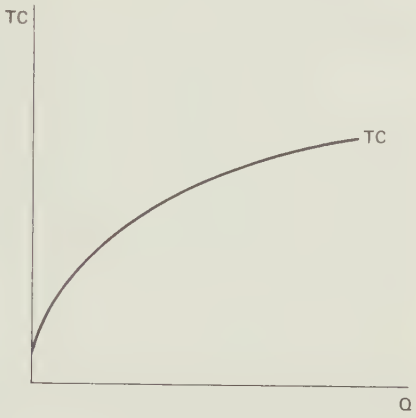
TC is total cost
FC is fixed cost
VC is variable cost per unit
Q is quantity
TAC is total average cost
MC is marginal cost

Graph A shows the form of the cost functions for a given technique. The maximum production capacity of the technique is represented by $Q^{max}$.

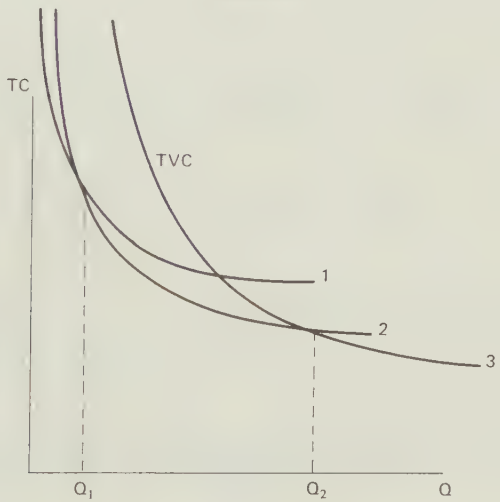
Graph A




Graph B




Graph C




Graphs B and C show how the effect of economies of scale can be represented using the simple cost functions. The heavy line in graph B represents the (concave) long-term total cost curve. How the technique selected changes according to the quantity produced is shown in graph C: technique 1 is the most advantageous up to $Q_1$, between $Q_1$ and $Q_2$, technique 2 will be chosen, for outputs larger than $Q_2$ technique 3 produces at lowest cost.

Since the quantity demanded varies with price, we should in principle have to consider the whole range of techniques and choose the one allowing the production of the largest surplus. The aim of co-operation projects is not overall optimization (or surplus maximization), but optimization within certain well-defined political constraints. By fixing in advance the price at which the product should be offered, the Governments determine the level of welfare that has to be reached and, at the same time, the total demand for the product, or at least its order of magnitude. This makes it possible to reduce considerably the number of techniques that have to be studied.

Apart from the fixed-price assumption mentioned in the previous paragraph, which is of a political nature (the Governments, not the planners, have to decide on the level of welfare), a number of technical assumptions are used in the rest of the section. They do not enhance the generality of the approach as their removal is always possible without altering the sense of the results, but they do considerably simplify the presentation. Firstly, we act as if the prices fixed by the Governments are the same for all the countries. This will probably not be the case. To remove the assumption it is sufficient to modify the scalars $P^A$ and $Q^A$ into vectors whose elements are the different national prices and market sizes respectively. Secondly, we assume that the full amount of the price paid by the consumer goes to the producers, in other words, there are no indirect taxes levied on the product. The price compensations accruing to the Government (see next section) can be considered as the way in which the Governments receive their indirect-tax income. Thirdly, all the calculations done in the rest of this section and the next refer to one year—either the first or the fifth year of operation. This means that all the calculations listed have, in fact, to be carried out twice: first for the initial year, when the project starts its production, probably still rather inefficiently, and second, for the fifth year when efficiency has to be reached and the agreement comes to an end. The minimum and maximum values of the effects that can be expected of the project are supposed to give a good approximation of the exact time profile of effects between the two years.

We now look in more detail at the way in which we shall represent the cost structure of the techniques of production. Introducing the notation we shall be using in the rest of the section, we can write the cost structure as follows:

$$P^A Q^A = \sum_{i=1}^{n} FI_i^{A1} P_i + \sum_{i=1}^{n} VI_i^{A1} Q_a^A P_i + S^{A1}$$

where:

$P^A Q^A$ indicates price and quantity of product,

$FI_i^{A1}$ and $VI_i^{A1} Q^A$ stands for the quantity of fixed and variable inputs needed to produce the given quantity of product A using technique 1,

$P_i$ is the price of input $i$,

$S^{A1}$ is the surplus generated by the production of $Q^A$ units of product A using technique 1 (S lumps together taxes, interests and profits).

In the text we shall use capital letters (A, B, C, . . .) to label the different products. An arabic numeral added to a capital letter (A1, A2, A3, . . .) will represent the technique (1, 2, 3, . . .) used to produce the product concerned. Both symbols will be used in superscript.

The inputs can be split up in the following way:

$i = 1, \ldots, d$ are imported inputs,

$i = e, \ldots, h$ are domestic products and services,

$i = i, \ldots, m$ are primary factors of production.

We assume for simplicity that the fixed cost consists only of the depreciation of investment and the administrative overhead costs (top level management). Moreover, we assume that variable primary inputs consist only of labour. The imported inputs can be valued at the world market price, the domestic inputs at the local market price (including indirect taxes).

The cost price equation can now be rewritten as follows:

$$P^A Q^A = \sum_{i=1}^{d} VI_i^A Q^A P_i + \\ + \sum_{i=e}^{h} VI_i^{A1} Q^A P_i^I + L^{A1} Q^A W^I + INV^{A1} D^{A1} + MANC^{A1} + S^{A1} \quad (1)$$

where:

$P_i^I$ and $W^I$ stand for the prices of domestic input $i$ and for local wages in country I,

$INV^{A1}$ and $MANC^{A1}$ are the investment cost and the fixed management cost of technique A1,

$D^{A1}$ and $L^{A1}$ are the depreciation rate and the labour input coefficient of technique A1.

The analysis of direct and indirect effects is based on this equation. By rearranging the terms, the indicators for the creation of investible surplus and earnings of foreign exchange can be obtained.

### *Transport costs*

Transport costs play an important role in determining the optimum location of production. Two kinds of transport costs will have to be dealt with. In the first place, products have to be transported from their place of production to the place of consumption or use. For export to partner countries, we ignore the regional pattern of demand and assume that the whole quantity of the product has to be delivered to one place (capital or port) that is determined in advance and may be different for different products. We further assume that the goods are transported by firms from the country or origin. The point of delivery selected represents roughly the point of gravity of the geographical pattern of demand in the partner country.

For the domestic market, the pattern of demand can be taken into account in more detail. The transport cost to the main centres of consumption can be introduced explicitly into the analysis. If this calculation is too cumbersome, the geographical pattern of demand can also be replaced by a rough estimate of its centre of gravity. The total cost of transporting the product from its location of production U to the centres of consumption is:

$$\left( a^I Q^A D^{UI} + \sum_{j=II}^{N} a^j Q^A D^{Uj} \right) TP$$

where:

$a^I, a^{II}, \ldots, a^N$ represent the demand shares of country I, II, ..., $N$ for product A, $\sum_{j=I}^{N} a^j = 1$,

$a^I$ can be a scalar as well as a vector (representing the geographical pattern of domestic demand),

$D^{Uj}$ is the distance between location U (where the project is situated) and the demand centres of the different countries $j = I, II, \ldots, N$,

$D^{UI}$ is the distance between location U and country I and can be a scalar as well as a vector,

TP is the transport cost per unit of distance.

The second kind of transport cost to be taken into account is the cost of bringing the inputs to the place of production. For imported inputs, the costs are calculated starting from the port of entrance. For domestic inputs the distance is taken from the normal (or cheapest, in the case of many) sources of supply to the project. A problem arises for domestic inputs that are not transported by road or rail (for example electricity transmitted by means of a power grid system). Only if the costs of such inputs differ greatly within the country (which is unlikely for a small or medium-sized country) should this "distance" be taken into account, in which case a distance factor should be calculated that measures the cost of bringing the input to the place of production and is expressed in units of transport cost. The transport cost of the inputs can be written:

$$D^{iU}\, VI_i^{A1}\, Q^A\, TP$$

where $D^{iU}$ is the distance between the source of supply of input $i$ and localization U, and other symbols have the same meaning as before.

The total transport cost is equal to the sum of the cost of transporting the inputs plus the cost of transporting the outputs. As we are interested in the difference between production in co-operation and the alternative of importing the product, there is one more factor that should be taken into account. If the product is imported, the cost to the buyer exceeds the c.i.f. price (abstracting from transport costs) by the cost of local transport between the port of entry and the centres of consumption. Assuming that the geographical pattern of demand will not change, we can calculate an average transport-cost factor that can be used for estimating how much it would cost to bring the product to the consumers if, in the target year, demand for the co-operation project's product had to be imported. The total transport cost is equal to the quantity transported multiplied by the distance travelled and the price. If an estimate of the present total transport cost can be obtained (from importers and wholesale dealers, for example) a transport cost equalization factor (TCEF) can be calculated, equal to the total transport cost divided by the total quantity times the unit price of transport.

Starting from:

$$TTC_0^A = \sum_k a_0^{Ik}\, D^{Mk}\, Q_0^{AI}\, TP_0$$

where:

$TTC_0^A$ is the total domestic transport cost of product A in year 0,

$D^{Mk}$ is the distance between the port of entry and the centres of consumption $k$ in country I,

$a_0^{Ik}$ is the present regional distribution of demand (coefficients adding up to 1) $k$ = centres of demand in country I,

$Q_0^{AI}$ is the quantity of A sold in country I in period 0 (the subscript 0 refers to the current period),

we calculate:

$$TCEF = \frac{TTC_0^A}{Q_0^{A1}\, TP_0} = \sum_k a_0^{Ik}\, D^{Mk}$$

As $D^{Mk}$ obviously will not change, TCEF will be constant over the years if $a_0^{Ik}$ (the geographical pattern of demand) does not change.

Summarizing, we can define the total transport cost associated with a localization of production as:

$$\left( \sum_{j=I}^{N} a^j\, D^{Uj} + \sum_i D^{iU}\, VI_i^{A1} \right) Q_A\, TP \qquad (2)$$

and the net total transport cost (taking into account the transport cost associated with the import alternative) that will be needed to calculate the net gain of the project as:

$$\left( \sum_{j=1}^{N} a^j \, D^{Uj} + \sum_i D^{iU} \, VI_i^{Aj} - a^1 \, TCEF \right) Q^A \, TP \qquad (3)$$

A problem arises when the unit costs for the different means of transport are not the same. As long as the differences are not considerable, the form of the total transport cost equation need not change. If the differences are important, the different types of transport have to be taken into account separately. In order not to complicate the presentation, we assume that only road transport is used.

### *Analysis of direct effects*

The analysis of the direct effects must make it possible to select a small number of techniques of production that are well suited to produce the co-operation product we are studying in the country concerned. Consequently, we have to compare the characteristics of the various techniques of production with the characteristics of the country. The country's characteristics can be grouped under three headings: the market prices, advantages (and disadvantages) in the supply of certain factors, and weights attached to the different development aims. At this stage we do not take the transport costs into account.

Rearranging the terms of equation (1) we obtain the expression for the total investible surplus, expressed in market prices (not taking into account the external effects of the project):

$$S^{A1} = Q^A \, P^A - \sum_{i=1}^{d} VI_i^{A1} \, Q^A \, P_i - \\ - \sum_{i=e}^{h} VI_i^{A1} \, Q^A \, P_i - L^{A1} \, Q^A \, W - INV^{A1} \, D^{A1} - MANC^{A1} \qquad (4)$$

all prices are inclusive of taxes–the superscripts I are dropped). Total surplus produced as measured in equation (4) contains the different forms of income that are assumed to accrue to the Government: direct and indirect taxes, interests and profits.

We can also use equation (1) to calculate the foreign exchange gain generated by the project. This gain is equal to the local value added (the value added remaining in the country):

$$LVA^{A1} = S^{A1} + L^{A1} \, Q^A \, W + INV^{A1} \, D^{A1} + LSP \cdot MANC^{A1} \qquad (5)$$

where: LSP is the coefficient for local skilled personnel ($0 \leqslant LSP \leqslant 1$) and it indicates the part of the managerial overhead costs that remains in the country.

On the basis of equations (4) and (5) and of the income distributed by the project, we can define the direct gains, in terms of investible surplus, measured in market prices:

$$DG^{A1} = S^{A1} + \phi \, LVA + \lambda \, W^I \, L^{A1} \, Q^A \qquad (6)$$

where: $\phi$ and $\lambda$ are the weights attached to foreign exchange gains and additional distribution of income, as explained in section III. Dividing $DG^{A1}$ by the cost of investment, calculated as indicated in the previous section, gives a first criterion for ranking the various technical alternatives for producing product A in country I. The

data have to be presented to the Government concerned in the form given by equations (4), (5) and (6), and they form the basis for a first exchange of views between the planners and the policy makers.

Since all the production techniques listed have the same capacity to generate indirect effects, because they use all the inputs roughly in the same proportions, the ranking obtained by the criterion $DG^{A1}/INV^{A1}$ will not have to be changed from the planners' point of view. If the proportions in which inputs are used do differ a lot, the capacity of the various techniques to produce indirect effects has to be tested. Indirect effects will occur particularly in those fields where the country has advantages (mineral deposits, agricultural potential, hydroelectric potential, unused capacity in existing production units). This advantage can be passed on to the project by charging a lower price for the input concerned. In order to test the relative capacity of the various production techniques to produce indirect effects (by using those inputs that are in advantageous supply) the planners have to test the sensitivity of the ranking they obtained to variations in the price of domestic inputs. They can calculate either the effect on the ranking of a change in the prices, or the change in prices necessary to modify the ranking.

The result of this analysis is the second set of data that have to be presented to the policy makers, on the basis of which they will be asked to express their preferences for one technique rather than the other. When the politicians' choice is very different from the ranking made by the planners, there are three possible causes. Firstly, the planners' estimation of the weighting coefficients is not correct. Secondly, the politicians' choices are inconsistent. Thirdly, the politicians attach great weight to some other policy objective that was not considered by the planners. In all three cases, a dialogue between planners and policy makers is the only way to sort out the problem. After the preliminary selection has been completed, the planners can start preparing the next phase of the selection process—the analysis of the total effects of the projects.

### *Detailed analysis: indirect effects*

Up until now we have not taken into account the effects of the project on the rest of the economy, nor did we question the prices that the project pays for its domestically produced inputs. Theoretically, the most elegant way to solve this problem is the use of shadow prices. However valid they may be theoretically, however, shadow prices are based on a number of assumptions that are sometimes difficult to grasp for the policy maker and would undoubtedly lead to endless discussions when the efficiency of different projects has to be compared. As explained in section III, we opted for the use of the cluster concept and of the semi-input-output method. The semi-input-output method is based on the inverse matrix of the technical coefficients of the domestic production sectors. The definitions we use are not quite the same as those used in the original model. We count as belonging to the national sector also industries producing tradeable goods that have not yet reached their production capacity. We classify the industries producing tradeable goods that have reached full capacity utilization in the international sector.

Using the semi-input-output method, the total increase in supply necessary to produce the quantity of domestic inputs needed by the project can be calculated. Multiplying the total increase in output of the different sectors by the vectors of the marginal labour coefficients and the marginal import coefficients gives the increase in labour costs and imports respectively caused by the production of the project.

$$\Delta \mathbf{Q}^{A1} = (1 - A)^{-1} \mathbf{VI}^{h}$$

where:

$\Delta \mathbf{Q}^{A1}$ is the increase in output of the different national sectors, caused by the increase by one unit of output A, produced by technique 1,

A is the matrix of technical coefficients for the national sectors only,

$\mathbf{VI}^{h}$ is the vector of variable inputs produced by national sectors.

The indirect effects can be represented as follows:

$$\text{Increase in imports } \mathbf{P} \cdot M \cdot \Delta \mathbf{Q}^{A1}$$
$$\text{Increase in labour cost } W \cdot \mathbf{L} \cdot \Delta \mathbf{Q}^{A1}$$

where:

M is a matrix of import coefficients (*d* rows),

**P** is the vector of import prices (*d* elements),

**L** is the vector of marginal labour coefficients (can also be a matrix if different types of labour are distinguished; in that case W is a vector rather than a scalar).

Using vector notation rather than summation signs to simplify notation, we can now rewrite equation (1) as follows:

$$P^{A} Q^{A} = \mathbf{PVI}_{f}^{A1} Q^{A} + WL^{A1} Q^{A} + \mathbf{PM} \Delta \mathbf{Q}^{A1} Q^{A} + WL \Delta Q^{A1} Q^{A} + D^{A1} INV^{A1} + MANC^{A1} + S^{A1'} \quad (1')$$

where:

$\mathbf{VI}_{f}$ is the vector of variable inputs—import coefficient,

M denotes the matrix of import coefficients,

$S^{A1'}$ denotes the total surplus, taking into account the indirect effects.

Rearranging the terms, we can rewrite equations (4) and (5):

$$S^{A1'} = P^{A} Q^{A} - Q^{A} [\mathbf{P} (\mathbf{VI}_{f}^{A1} + \mathbf{M} \Delta \mathbf{Q}^{A1}) + W (L^{A1} + \mathbf{L} \Delta \mathbf{Q}^{A1})] - D^{A1} INV^{A1} - MANC^{A1} \quad (4')$$

$$LVA^{A1'} = S^{A1'} + Q^{A} W (L^{A1} + \mathbf{L} \Delta \mathbf{Q}^{A1}) + D^{A1} INV^{A1} + LSP \cdot MANC^{A1} \quad (5')$$

We have now all the elements to calculate the direct plus indirect gain produced by the project:

$$I + DG^{A1} = S^{A1'} + \phi LVA^{A1'} + \lambda W (L^{A1} + \mathbf{L} \Delta \mathbf{Q}^{A1}) Q^{A} \quad (6')$$

The investment cost has to be recalculated in the same way as the production cost, so as to take into account the indirect effects generated by the production of the inputs necessary for the investment. We represent the recalculated investment cost by $INV^{A1'}$. Dividing the direct and indirect gain by the investment cost gives a second criteria for ranking the projects. The equations (4'), (5') and (6') summarize the information that has to be passed on to the policy makers and that has to orient the next round of discussions about the selection techniques of production. One problem now remains to be solved—the optimum location of the project.

### *Detailed analysis: introduction of transport costs*

Up until now, the projects have been considered in a vacuum. Now we have to introduce into the analysis the fact that inputs have to be transported to the plant and that outputs have to be transported to the centres of consumption. On the basis of the transport costs, we shall select the optimum location according to national criteria. The question arises to what extent the ranking of projects, obtained by using the criterion defined in the previous paragraph $(I + DG)/INV^{A1'}$ will be affected by the introduction of the transport costs. The introduction of the transport costs of the output cannot affect the ranking, because all the projects are producing the same product. The introduction of the transport costs of inputs can alter only the ranking input combinations, which are very different, particularly for inputs that can be supplied in advantageous conditions. If an output can be produced either by factor *f* or by factor *g*, and *f* is found at one location while *g* is found at another (in the same country), the ranking of the two techniques might change from one location to another. If this situation is unlikely to occur, the ranking obtained in the previous section can be maintained, and the optimum location chosen on the basis of transport costs alone. Otherwise, a detailed analysis will have to be undertaken.

The total transport cost, as defined in equation (2), can, as all the costs expressed in market prices, be split up into three parts: labour costs, imports and surplus. Since transport is a national sector, the semi-input-output method can be applied to determine the total additional output of national sectors necessary to make the expansion of transport possible. We simplify the matter by assuming that for every unit of transport, we can calculate a labour coefficient and an import coefficient. The total real cost of transport of inputs and outputs of project A1 can be written as:

$$Q^A WL^t \left(\sum a^j D^{Uj} + \sum D^{iU} VI_i^{A1}\right) + PM^t \left(\sum a^j D^{Uj} + \sum D^{iU} VI_i^{A1}\right)$$

where:

$L^t$ is the labour coefficient of the transport sector,

$M^t$ is the import coefficient of the transport sector.

The first term between the brackets has to be added to the labour cost, the second to the import cost.

Equations (4′) and (5′) can be rewritten as:

$$S^{A1*} = S^{A1'} - Q^A \left[(WL^t + PM^t)\left(\sum a^j D^{Uj} + \sum D^{iU} VI_i^{A1}\right)\right] \qquad (4^*)$$

$$LVA^{A1*} = LVA^{A1'} - Q^A PM^t \left(\sum a^j D^{Uj} + \sum D^{iU} VI_i^{A1}\right) \qquad (5^*)$$

To make the presentation of the total gain equation simpler we introduce a symbol for total additional employment:

$$TAE^{A1*} = Q^A \left[L^{A1} + L \Delta Q^{A1} + L^t \left(\sum a^j D^{Uj} + \sum D^{iU} VI_i^{A1}\right)\right. \qquad (7)$$

The investment cost $INV^{A1'}$ calculated in the previous section has to be corrected to take into account the differences in transporting the equipment to the place of production and possible differences in construction costs. $INV^{A1*}$ stands for the investment cost, taking into account the indirect effects of the investment and the differences in cost associated with each location. The asterisk in the superscripts indicates that transport cost has been taken into account.

Using the definitions of the symbols, given in equations (4*), (5*) and 7, we can now write the total gain of the project A1*, i.e. the project producing product A, using technique 1 at location *:

$$TG^{A1*} = S^{A1*} + \phi\, LVA^{A1*} + \lambda\, TAE^{A1*} \qquad (6*)$$

The total gain divided by the investment cost provides a final criterion of ranking the different projects producing A. On the basis of this information, the policy makers in collaboration with the planners decide for each identified co-operation product which is the best technique of production and location of the plant, according to the economic characteristics of the country and the preferences of the policy makers. A final decision still has to be made: which of the projects selected (i.e. one project for each co-operation product) is worth presenting in the regional negotiations? To this question we turn in the next section.

### *Net gain*

Until now we have compared only projects producing the same product for the same market. The total gain divided by the investment cost provided a sufficient criterion for ranking the different projects. In order to be able to decide whether the implementation of the best project is worthwhile as such, total gains have to be compared with the total gains associated with the alternative situation. This alternative consists of two parts: imports (at world market prices) of the quantity of the product necessary to supply the domestic market, and investment of the total capital outlay elsewhere in the economy. The net gain of the best project will be its total gain as defined in equation (6*), minus the total gains of the alternative.

The first element of the alternative is easy to handle. The imports create no additional employment. They imply, however, a loss of investible surplus equal to the difference between the import cost and the (predetermined) market price, adding the cost of getting the product to the consumer. The loss in foreign exchange is equal to the whole import bill. As we discussed under transport costs, imports necessitate local transport to bring the product to the consumer or user. To find the additional imports and labour costs associated with the local transport, we multiply the factor $a^{I}TCEF$, used in equation (3), with $PM^{t}$ and $WL^{t}$ respectively. We can sum up the various elements, appropriately weighted, as follows:

$$\begin{aligned}
\text{Effect on investible surplus} &= -(P^{MA} - P^{A})\, a^{I} Q^{A} - (PM^{t} + WL^{t})\, TCEF\, a^{I} Q^{A} \\
\text{Effect on foreign exchange} &= -(1+\phi)\, P^{MA} + \phi\, PM^{t}\, TCEF\, a^{I} Q^{A} \\
\text{Effect on labour income} &= +\lambda\, WL^{t}\, TCEF\, a^{I} Q^{A}
\end{aligned}$$

The second element of the alternative is the investment of capital outlay of the project elsewhere in the economy. By analysing the projects mentioned in the plan, an estimate can be made of the average effects associated with an alternative use of the funds. Weighting the surplus, foreign exchange gains and income creation as before, we can calculate an average gain, obtained by the alternative allocation of one unit of investment. For each project, the alternative gain can be calculated by multiplying the average gain by the size of the investment. The effects of the alternative projects are estimated for the same target years as used for the analysis of co-operation projects: first year of operation and fifth year of operation. For a given capital outlay, the gain obtained from an investment in alternative projects is:

$$G^{alt} = S^{alt} + \phi\, LVA^{alt} + \lambda\, TAE^{alt} \qquad (8)$$

Adding the effects of the imports and of the alternative investment together, an estimate of the total gain can be obtained. This alternative total gain can be split up into three parts:

The effect of importing the product:

$$-(P^{MA} - P^{A}) + (1 + \phi)\, P^{MA}\, a^{I}\, Q^{A} \qquad (9.i)$$

The effect of local transport:

$$-[(1 + \phi)\, PM^{t} + (1 - \lambda)\, WL^{t}]\, TCEF\, a^{I}\, Q^{A} \qquad (9.ii)$$

The effect of alternative investment:

$$S^{alt} + \phi\, LVA^{alt} + \lambda\, TAE^{alt} \qquad (9.iii)$$

$$TG^{alt} = (9.i) + (9.ii) + (9.iii) \qquad (9)$$

The second and the third effect do not change with the source of supply of the imports. They are a fixed alternative gain. The first effect, however, changes with variations of the import price. This will be important in the regional comparison of projects.

The net gain of the co-operation project is the difference between its total gain and the alternative total gain as defined above. It is on the basis of the net gain that the Government will have to decide whether to submit the project for acceptance by its partners. A project with a negative gain is obviously not worth presenting; projects with a small net gain stand only a slight chance of being accepted as the net gain is the basis of the compensations the country is going to have to offer its partners to induce them to accept the project in the co-operation scheme. This is the problem we turn to in the next section.

## V. Comparison of projects

### *Introduction*

In order to arrive at a regional co-operation package, the national choices have to be compared. Until now, the relevant alternative used in the analysis was the import of the product concerned at world market prices. This is the price at which the product can be obtained if there is no domestic production. At the same time it is the maximum price at which the co-operation product could be offered. If the supply price were higher, countries would have no interest in joining the scheme. In the static sense, and from a short-run point of view, countries would not be losing if they agreed to import from a partner at world market prices.

In the long-run, dynamic sense, some countries are gaining where others are not gaining and may even be losing if they have to sign some sort of a purchasing agreement, forsaking the establishment of a similar project on their own territory. The losers (or non-gainers) have to be compensated by the gainers in the case of each individual project. Moreover, in order to be viable, the co-operation scheme has to realize a more or less balanced distribution of projects among the participating countries. We shall first determine the composition of the most "efficient" co-operation package and, secondly, modify the location of the projects to arrive at a politically viable solution.

### *Compensations*

The most efficient package is reached when each production venture is located in the country where it can be produced most economically. This package implies the largest capacity of offering compensation to the purchasing partners. This compensation can take many forms. We briefly discuss the following: participation in financing of the projects, co-operation in the supply of inputs or labour and purchasing agreements.

Participation in the financing of the capital outlay diminishes the cost in the producing country, but reduces also the benefits that country draws from the project. Surplus and local value added will be lower in absolute terms, but the rate of surplus and of local value added is likely to be higher, because the rate of surplus is normally higher than the rates at which interest or dividends are paid. Little can be said, however, *a priori* as this kind of participation implies political problems (loss of sovereignty) that can be solved only by the decision-making body. Although a general option for financial participation in each other's investments can be contained in the original co-operation agreement, the solution of the practical problems, such as the size and form of the participation, can be reserved for the implementation stage. In the present context it can only unnecessarily complicate the calculations.

If agreements are made for the supply of inputs, it can be worked out to what extent the partners concerned are gaining (or losing) by the transaction. As far as the project is concerned, a comparison can be made between the old and the new import price, and the effect on the surplus and the local value added can be calculated. In the supplying country, additional surplus, local value added and employment will be generated. The input supplying sector can also be considered as a co-operation industry and as part of the package that we are trying to put together. For the sake of simplicity, it is best to keep the price as it was, that is, to assume that buying and selling of international inputs takes place at the world price, and to use price changes as a redistribution mechanism, as in the case of the output price.

In most cases, some kind of purchasing agreement will exist under which the partners undertake to buy the whole or part of their requirements from the co-operation project. Usually some kind of compensation is worked out as a function of the quantity bought. This compensation can take the form of a price reduction, a budget-to-budget subsidy, or a combination of the two. Since we assumed that the Governments fixed the price at which the product should be offered to the consumers, in our case the compensation will take the form of a budget-to-budget subsidy. We still assume, for simplicity, that all the Governments fixed the same selling price and that the indirect taxes they are levying on the product will not increase the price (which would change the quantity demanded), but be financed by the compensation received from the Government of the country where the project is located.

### *Maximum compensation*

The net gain, as defined in the discussion on pricing in section IV, determines the capacity of the Government to compensate its partners for signing a purchasing agreement. The compensation that will actually be offered during the negotiations depends on yet another factor—the Government's willingness to part with its net gain. This involves, however, a political decision, and we shall discuss only the maximum compensation, which defines the limit of the Government's proposals. As

the budget-to-budget subsidy is calculated on the basis of the quantity purchased, it can be considered as a price reduction, but one that accrues to the Government and not to the consumers.

To determine the maximum compensation per unit of output, it would be incorrect to divide the net gain by the quantity produced. The net gain is made up of three elements, each with its own weight; since the price compensation affects the various elements differently, a more complex calculation is necessary. The maximum compensation is the one for which the net gain of the project becomes zero, or for which the total gain of the project becomes equal to the total alternative gain defined in equation (9) of the last section. A price compensation offered to the partner Governments neither affects the cost of production nor diminishes the receipts from local sales. A price compensation diminishes the investible surplus and the foreign exchange gains, leaving the employment creation unaffected. The maximum price compensation is the one that exhausts the net gain. To calculate $P^{A}_{min}$ we put

$$TG^{A1*} - TG^{alt} = NG^{A1*} = (P^{A} - P^{A}_{min}) \sum_{j=II}^{N} a^{j} Q^{A} + \phi (P^{A} - P^{A}_{min}) \sum_{j=II}^{N} a^{j} Q^{A}$$

$$\text{or} \quad P^{A}_{min} = P^{A} - \ldots \frac{NG^{A1*}}{(1+\phi) \sum_{j=II}^{N} a^{j} Q^{A}} \qquad (10)$$

The maximum price compensation is equal to the net gain divided by the quantity sold abroad, appropriately weighted for the foreign exchange premium. $P^{A}_{min}$ indicates the price at which it is still interesting for country I to undertake the project. Only prices equal to or higher than $P^{A}_{min}$ make it possible to produce a net gain.

### *Negotiation: the optimum package*

In the preceding paragraphs we calculated the maximum compensation without taking into account the price compensations offered by the other countries. This offer changes the alternative situation. The gains from alternative investment and local transport (items 9.ii and 9.iii in equation (9)) do not change, but the cost of import (item 9.i in equation (9)) is reduced by the gap between the world market prices and the price offered by the partner. The lower this price, the smaller becomes the net gain and the more attractive becomes the alternative. Taking into account the two elements, price compensation offered and price compensation received, we can determine the most efficient location of the project—the location that makes the largest price compensation offer possible.

On the basis of equation (9), we redefine the net gain. The net gain is equal to $TG^{A1*}$ $TG^{alt}$. While $TG^{A1*}$ is fixed $TG^{alt}$ varies with the import prices. We can split up $TG^{alt}$ into two parts—the first fixed, the second variable. Using $FG^{alt}$ as the symbol for the fixed alternative gain (items 9.ii and 9.iii) we can rewrite the net gain as a function of the import prices:

$$NG^{A1*} = TG^{A1*} - FG^{alt} - (P^{AP} - P^{A})\, a^{I} Q^{A} \qquad (11)$$

where $P^{AP}$ represents the price demanded by the partner, $(P^{AP} - P^{A})$ being the price compensation.

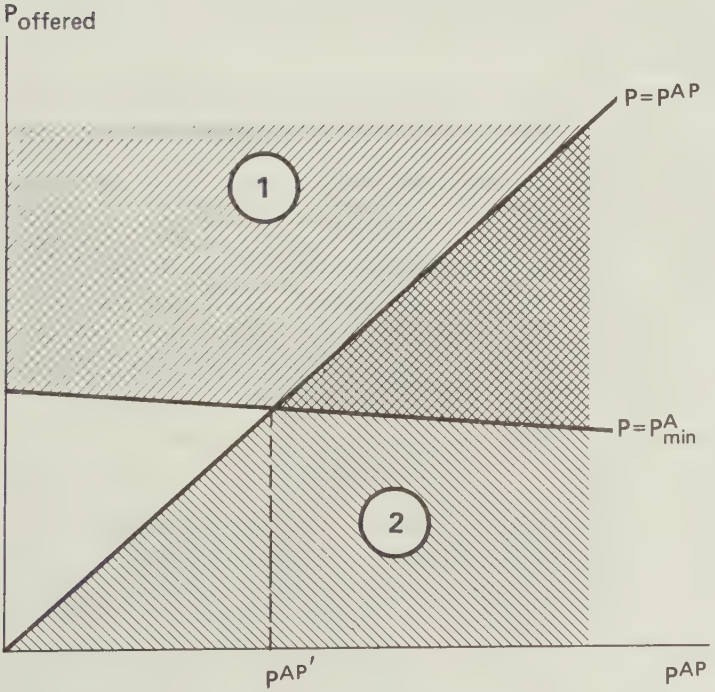
Using equation (11), we can now rewrite equation (10) as

$$P^{A}_{min} = P^{A} - \frac{TG^{A\bar{1}*} + FG^{alt} - P^{A}\, a^{I}\, Q^{A}}{(1+\phi)(1-a^{I})\, Q^{A}} - \frac{P^{AP}\, a^{I}}{(1+\phi)(1-a^{I})} \qquad (10')$$

This equation expresses $P^{A}_{min}$ as a function of $P^{AP}$. The first two terms after the equality term are constant. The total constant term is positive and the coefficient of $P^{AP}$ is negative.

$P^{A}_{min}$ is the price for which the gain produced by project $A^{1*}$ is exhausted. Consequently, only if the price actually offered is equal to or higher than $P^{A}_{min}$ is it worthwhile for the country concerned to undertake the project. If the price discussed in the negotiations descends below the $P^{A}_{min}$ level, the implementation of the project would entail losses. Moreover, the partner countries are not going to consider an offer by country I if its price exceeds the level of the other price offers. These two inequalities define the price for which the decision of country I switches from national production to imports from a partner:

1. Price offered by country I $\geq P^{A}_{min}$ (equation 10′)
2. Price offered by country I $\leq P^{AP}$




If the partner countries are able to offer prices lower than $P^{AP'}$, country I has to withdraw from the negotiations about the localization of the co-operation plant producing product A. The project will be assigned to the country that can offer the highest price compensation, i.e. for which the $P^{AP'}$ is lowest. (See the graph.)

In this way the optimum location for the plants producing each of the co-operation products can be determined. In fact, the negotiations are more complicated than this, because we have based the reasoning on the price compensation that could be offered in one year. The potential compensation for two years should be taken into account: the first year of operation of the project and the fifth year of operation (end of the agreement). The actual compensation offered will lie somewhere between the two extremes. The exact determination of the level is a political, rather than an economic, question. The planners can assist the policy makers by working out what the most advantageous proposal is. The alternative patterns of gains and losses over the years associated with different price proposals can be summed or discounted, and a price can be determined on the basis of some minimum acceptable net gain. This, however, is more a matter of collaboration between planners and politicians than pure economic calculus.

### *Political feasibility of the approach*

The efficient co-operation package constructed using the criteria described in the previous paragraphs takes into account the characteristics of the different technologies, the economic characteristics of the partner countries and the Governments' development objectives. The overall feasibility of the package, however, is determined by an additional factor: the distribution of the industries selected among the participating countries. There is no possible standard to judge the equity of a package, but it seems unlikely that a country can be induced to join the scheme if no industries are attributed to it, or if there is a strong concentration of industries in one or two countries.

The only way to remedy the situation is by political negotiation. Some countries will have to give up industries that will be reallocated to others. The optimum package constructed is an efficient allocation of industries, i.e. the one making the payment of the highest compensations possible. In order to safeguard efficiency, the industry shifts implying the least price increases (or losses of compensation) should be selected. This can be done by looking at the ranking of the countries for the different projects. For those projects where the country concerned comes close to the top, the losses incurred by a shift in the location should be calculated and a number of alternative patterns suggested to the policy makers. Here again, as in the other parts of the methodology, the only way of solving the problem is collaboration between planners and decision makers.

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# The evaluation of capital inflows*

*Deepak Lal***

## *Introduction*

Foreign aid and private foreign investment are the common whipping boys of writers in both the developing and developed countries, for, by now, many people have made up their minds that foreign capital inflows are inimical to development. In one view, they represent the spread of the neo-imperialism of the capitalist world which exploits the developing countries and keeps them perpetually dependent.[1] In another view, while private foreign investment inflows may promote growth, foreign aid is at best a palliative (preventing the necessary institutional reforms required for development) and at worst, by weakening domestic incentives to save and the consequent will to develop through one's own efforts, could lead to the pauperization of the recipients.[2] Adherents of these views, which are at opposite ends of the political spectrum, will find the arguments advanced and the methods of appraisal advocated in this paper either the most ivory-tower scholasticism or a blatant apologetic for the perpetuation of the enslavement or pauperization of the third world. For, although opponents of aid and foreign investment put forward some strictly economic arguments—which shall be considered in subsequent parts of this paper—they are primarily concerned with the institutional and in the broad sense political impact of such inflows. To treat only the strictly economic aspects in evaluating aid and foreign investment inflows, for them, would be equivalent to performing "Hamlet" without the Prince of Denmark. Therefore, the concluding section of this paper will include a brief discussion of the non-economic aspects of evaluating aid and foreign investment inflows.[3]

With the recent emergence of various Oil and Petroleum Exporting countries (OPEC) as important alternative financiers of development in the third world, it is hoped that these political considerations may in time appear to be secondary compared with the strictly economic ones of appraising foreign capital inflows. For now that some of the countries in the third world are themselves important donors of aid to and foreign investors in other developing countries, the simple politics of the old orthodoxy of the left or right would seem to be less applicable. This paper, therefore, examines the various approaches used in the past to evaluate the economic effects of aid inflows. It is argued that these are inappropriate, in part because of the aggregative macro-economic framework in which such analyses have been conducted,

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[1] See, for instance, Hayter [1], whose very title "Aid as imperialism" accents this theme.

[2] See, for instance, P. T. Bauer [2] and his other writings. A good critique of these is Stern [3]. On poverty and pauperization Bauer states: "The flow of sustained indefinite aid implies an obvious and yet widely ignored danger–the pauperization of the recipients. A pauper is one who relies on unearned public assistance, and 'pauperization' accordingly denotes the promotion and acceptance of the idea that unearned doles are a main ingredient in the livelihood of nations" ([2], p. 35).

[3] A fuller, though by no means exhaustive, discussion will be found in part V, "Passion, politics and power", in the author's book on foreign investment [7].

in part because of the lack of any explicit framework of social welfare maximization in these analyses, and in part because a macro-economic framework, while suggestive, is unlikely to be of much operational use for actual policy purposes in recipient countries since Governments more often must negotiate or appraise capital inflows for specific projects or programmes. Hence, in the second part of this paper the argument is made that the recent proposals for systems of project appraisal (Little-Mirrlees [4 and 5] and Dasgupta-Marglin-Sen [6]) provide a framework that is more useful in forming judgements on many policy issues in this area.

## I. Macro-economics

The effects of foreign capital inflows into developing countries have been assessed traditionally within an aggregative (macro-economic) framework, with judgements being formed about the circumstances under which such inflows are likely to aid the development of the recipient countries. An extension of the simple Harrod-Domer model of economic growth, amended to take account of rigid savings and foreign-exchange constraints to yield the so-called two-gap models of foreign capital requirements and economic development (UNCTAD [8], McKinnon [9] and Chenery and Strout [10]), has been the basic tool of analysis in this tradition. This model purports to show that developing countries in general, are faced by independent savings and foreign-exchange constraints, and that foreign capital inflows will then necessarily be required to overcome the dominant constraint (foreign exchange for early and savings for later stages of development) to achieve any given desired (or "warranted" in Harrod's original terminology) [11] rate of growth for the economy.

The author has attempted elsewhere (Lal [12 and 13]) to set forth the logic of this model in terms of traditional international trade and growth theory, and has shown that the assumptions required to generate a foreign-exchange constraint to growth which is independent of a savings constraint are extremely unrealistic. Hence these two-gap models, with their mechanistic projections of necessary foreign capital requirements for development, are likely to be highly misleading. More specifically, it can be demonstrated that in order to generate a foreign-exchange constraint that is independent of a savings constraint so that there is a redundancy of ex ante savings in a country, it is necessary that the following four assumptions must hold simultaneously:

*(a)* That the import content of current production must be unalterable;

*(b)* That there must be no further possibilities of import substitution;

*(c)* That all possibilities for increasing export earnings must be exhausted (complete inelasticity of export earnings);

*(d)* That the marginal social utility of current consumption must be zero.

As regards the first three assumptions, while it is possible that all three may hold for some economies in the short term, it is extremely unlikely that they will hold in the medium or long term. For the longer the period, the more unlikely it becomes that import coefficients cannot be reduced, that import substitutes cannot be developed, or that exports cannot be diversified into lines for which foreign demand is relatively more elastic. The relaxation of any one of these rigid assumptions would lead to breaking the foreign-exchange bottle-neck. Finally, the last assumption is in flat contradiction to another assumption commonly made about developing countries, namely, that the Government has imperfect control over current

consumption and hence the level of overall savings is suboptimal in the economy,[4] and that in its choice of techniques the Government should use a shadow factor price ratio which takes account of the effect of the income distributional (consumption-savings) effects of techniques with differing capital/labour ratios. One cannot believe that there is a problem of choice of techniques for an economy (which entails balancing impatience against productivity in making investment decisions) at the same time that this economy is suffering from a foreign-exchange bottle-neck.

This implies, therefore, that most developing countries are likely to be constrained in their growth by current savings and that seeming foreign-exchange difficulties are not signs that they are in a structural foreign-exchange bottle-neck, as postulated by the proponents of the two-gap models, but rather that they suffer from foreign-exchange *shortages* which result from the maintenance of a disequilibrium price of foreign exchange, namely an overvalued exchange rate. This argument against the theory of the foreign-exchange bottle-neck also counters one of the conclusions of the advocaters of two-gap models, namely, that the productivity of foreign capital inflows is higher in countries faced by a foreign-exchange constraint than in those faced by a savings constraint. It also suggests that the mechanistic projections of foreign capital (in particular foreign aid) requirements often made (for instance by UNCTAD) in terms of the two-gap model are misconceived.

This obsession with foreign exchange and the balance of payments is also characteristic of many studies of the macro-economic effects of private foreign investment in developing countries.[5] Attempts have been made to measure the overall balance of payments effects of foreign investment; thus, it is argued that if the balance of payments is worsened the country must be worse off with such inflows. That this approach is misconceived can be seen in the fairly simple general equilibrium framework of the "absorption" approach to balance of payments theory. It is a matter of accounting that the balance of payments deficit (surplus) $B$ must exactly equal the excess (deficiency) of domestic expenditure $E$, over national output (income) $Y$, that is

$$B = Y - E$$

Suppose that the foreign investment does in fact raise national income (output), nevertheless if the government allows domestic expenditure to rise by more than the increase in output ($\Delta E > \Delta Y$), then the balance of payments will necessarily worsen and the foreign investment inflow, which is beneficial from a national income viewpoint, will appear to be inimical to the balance of payments. But whereas changes in national income (output) have implications for social welfare, changes in the balance of payments in themselves do not. Moreover, as the balance of payments effects can be what the Government chooses (for any given change in national income) through its control over aggregate domestic expenditure, the very sign of the balance of payments effects will be indeterminate.

An even simpler approach to appraising the effects of foreign investment on the host country is to compute the inflows and outflows on the capital account of the balance of payments associated with the foreign investment, and to argue that, if there is a net outflow, the foreign investment must be inimical to the country's development (for example, Kidron [15]). However, there is one assumption which, in

[4] In the sense that the Government cannot raise the level of savings to the socially desirable extent.

[5] See, for instance, the studies by Needleman and S. Lall *et. al.*, sponsored by UNCTAD [14].

calculating the *internal rate of return* of this time-stream of capital flows and comparing it with the appropriate social opportunity cost of capital in the host country, provides a measure of the real income (welfare) effects of the foreign investment. The assumption is that, if the foreign investment did not take place, the alternative would be an identical domestically financed investment project, which differs from the foreign investment project only in its form of financing (Lal [16] and [7]). In most empirical exercises, however (Kidron [15]), the *undiscounted* net inflow of the time-stream of capital flows is computed and used to judge the real income or the balance of payments effects of foreign investment. (For a seeming justification of this procedure, see Streeten [17].) Apart from the obvious point that thus measured the only form of capital inflow that would benefit a country is one that leads to negative interest or profit rates for the foreign investors (a condition unlikely to persuade anyone to invest), this measure makes sense only if the alternative to the foreign investment "is the identical project with identical out-turn financed by reserves which yield nothing, either in interest or by affecting internal policies favourably–reserves which are purely a store of value and nothing else" (Little [18], p. 204). The irrelevance of this assumption to the conditions of most developing countries is apparent.

Thus, none of the macro-economic approaches hitherto considered are of much use in evaluating capital inflows. They either depend on making unrealistic assumptions or lack any explicit framework of social welfare maximization for forming policy judgements. However, one other approach, which may be labelled the cross-sectional econometric approach, does not suffer, prima facie, from these defects and has been used to argue that in particular foreign aid inflows are likely to be inimical to development (Griffin [19], Griffin and Enos [20] and Weisskopf [21]).

In this view, econometric evidence is used to suggest that "the impact of foreign capital inflows on ex ante domestic savings in underdeveloped countries is significantly negative" (Weisskopf [21], p. 37). From this evidence some authors have drawn the conclusion that "rather than accelerating development, (capital imports) have in some cases retarded it" (Griffin [19], p. 100). In opposition to this view it may be argued that the procedures used for statistical estimation are open to serious objection (Shourie [22]), but, more seriously, that the conventional definition of domestic savings used in these econometric exercises is highly misleading. For the purpose of analysing the effects of capital inflows on the level and, more importantly, on the growth of real income in a developing country, we need to know what happens to total investment (= total savings) (SI) as a result of the aid inflow. Alternatively, aid donors may be interested in the recipient country's own savings efforts, and for this purpose the level of the domestic part of total savings (SII) before and after the aid transfer will be of interest. Neither of these two definitions of savings, however, corresponds to the conventional definition of domestic savings, which is derived from the ex post national income identity:

$$B = I - S$$

where $B$ is the balance of payments deficit, $I$ is ex post domestic investment and $S$ is defined as ex post domestic savings. The balance of payments deficit is moreover identified with the net capital inflow *(F),* and the level of domestic savings is then derived as the difference between domestic investment $I$ and the capital inflow $F$

$$S \equiv I - F$$

This has the paradoxical effect of implying that, if the level of domestic investment remains unchanged in the pre- and post-aid inflow situations (so that the level of total savings is unchanged and is equal to a constant level of domestic savings,

SI = SII), nevertheless any capital inflow (positive $F$) will lead to a fall in domestic savings as conventionally defined (Mikesell and Zinser [23]). On the basis of this conventional definition of domestic savings, therefore, savings must necessarily be smaller, *ceteris paribus,* the larger the capital inflow, since domestic savings must always fall unless present consumption is an inferior "good", and even if domestic savings in the two relevant senses (SI and SII) remain constant or rise. In fact, it is easy to show (see the appendix) that domestic savings in either of the two senses (SI and SII) relevant for policy purposes cannot fall if both present and future consumption are normal "goods". While even if it were to be found that savings in these senses declined as a result of an aid inflow (basically because for the relevant economy future consumption is an inferior "good"), this could not be taken to imply that social welfare had declined (see the appendix). Once again, therefore, we come back to the basic question of evaluating foreign capital inflows within an explicit framework of social welfare maximization, and as that is precisely the basis of the various methods of project appraisal that have been suggested for making the all-important micro-economic investment decisions in an economy, it is pertinent to examine the uses of this methodology for making more meaningful evaluations of aid and foreign investment inflows into a developing country.

## II. Micro-economics

A useful starting point is to consider the circumstances in which specific foreign borrowing is desirable. The borrowing could be at the implicitly subsidized effective interest rate (which takes account of the "softness" of the loans in terms of the "real" interest rate charged and of the terms of repayment), or at normal commercial terms, say, on the Eurodollar market. The same principles would apply in appraising the desirability of such borrowing[6] in both cases, and would take account of loans used to finance either current consumption or investment or combinations of the two. This problem has been analysed in detail elsewhere (Lal [16]) in terms of the cost-benefit framework, which takes aggregate current consumption as its *numéraire* for measuring social values (that is, the Dasgupta-Marglin-Sen [6] framework), on the basis of alternative assumptions about such things as the grant element, excess import costs owing to the tying of aid to donor country imports on most types of foreign aid loans and grants, the proportions of the aid inflows supplementing domestic savings (SII above), and current consumption in the recipient country, and in terms of trade losses involved in repayments of interest and principal. The methodology essentially consists of comparing the net present value of a marginal investment project financed from internal sources with that financed from foreign sources; it also takes account of various domestic variables such as the changing scarcity of savings relative to current consumption and the Government's powers of controlling the level of consumption, the import content of current investment and the intertemporal pattern of social discount rates and social rates of return to investment.[7] The condition for a foreign capital inflow to be socially desirable is

[6] Thus we are considering foreign aid inflows and foreign portfolio investment. The problems associated with direct foreign investment are complicated because such investment typically also includes access to new management and technology. We discuss it separately later in this section.

[7] It should be noted that the social discount rate in the UNIDO method is the consumption rate of interest in the Little-Mirrlees (LM) method, but there is no equivalent to the UNIDO social rate of return to investment, which is in terms of consumption, in the LM method. The social rate of return of the text is not the LM accounting rate of interest (ARI), which is the marginal rate of return to investment in the economy in terms of savings (the LM *numéraire*).

given by:

$$\frac{(1-\theta)(1+e)}{\theta} - \frac{(1-g)(1+e)(1+s_T)(1+i)^T}{0(1+d_0)\dots(1+d_T)}$$

$$\left[(1-\gamma_T)\,r_T \sum_{n=T}^{\infty} \frac{}{(1+d_T)\dots(1+d_n)} + \gamma_T\right] + \tag{1}$$

$$+(1+ms_0)\left[(a-\gamma_0)\,r_0 \sum_{n=0}^{\infty} \frac{}{(1+d_0)\dots(1+d_n)} + \gamma_0\right] \geq 0$$

where:

$\theta$ is the percentage of the capital inflow which is invested,

$e$ is the percentage excess cost of imports owing to the tying of aid to the donor's imports,

$g$ is the percentage of the inflow which is in the form of a grant,

$i$ is the effective interest rate on the remaining $(1-g)$ per cent of the capital inflow and assumes that the principal and interest are paid in a lump sum at the end of $T$ years, the actual pattern of payments being converted to this assumed pattern to determine the effective interest rate,

$s_n$ is the percentage terms of trade loss that the recipient has to suffer in year $n$, to increase exports required for financing imports or for effecting a capital transfer for repatriating interest etc. in year $n$,

$d_n$ is the social discount rate (consumption rate of interest) in year $n$,

$\gamma_n$ is the percentage of domestic investment financed by reducing consumption in year $n$, with $(1-\gamma_n)$ the percentage from displaced investment,

$r_n$ is the social return to investment in period $n$; that is 1 rupee invested at date $n$ yields a perpetual consumption stream of rupees $(r_n)$, it being assumed for simplicity that there is no reinvestment from this consumption stream,

$m$ is the import content of current investment.

To see the implications of this condition, assume that the whole of the capital inflow invested ($\theta = 1$) and that the constraints on raising domestic savings and improving the rate of transformation of domestic into foreign inputs (via the terms of trade effects) remain fixed over the lifetime of the loan (this implies that $r,d,s$, and $\gamma$ are constant over time, that is, in (1), $r_n = r, d_n = d, s_n = s$ and $\gamma_n = \gamma$), then the above condition for assessing the desirability of foreign capital inflows becomes:

$$\left[\frac{(1-\gamma)\,r}{d} + \gamma\right]\left[(1+ms) - (1-g)(1+e)(1+s)\frac{(1+i)^T}{(1+d)^T}\right] \geq 0 \tag{1 a}$$

From this it is obvious that, if the whole of the capital inflow is a grant ($g = 1$), then (1a) is positive and, irrespective of the country's other characteristics, it should accept the inflow. Suppose, however, that at the other extreme there is no grant element in the capital inflow ($g = 0$) and, furthermore, that the country does not suffer any excess costs on its capital inflow-financed imports through aid tying (that is, that $\theta = 0$). Further assume that the important content of investment is unity[8]

[8] The argument applies equally if the import content of investment is zero, as can be seen by putting m = 0 in (1a). See Lal [16] for details.

($m = 1$), then it is obvious from (1a) that a capital inflow will only be desirable if the effective interest rate it has to pay for the inflow is less than or equal to its social discount rate ($i \leqslant d$). While clearly if there are excess costs of tied imports ($e > 0$), the lower the effective interest rate on the inflow will have to be relative to the social discount rate in the economy. As the social discount rate is likely to be less than the social return to investment in most developing countries, where the level of savings is less than the socially optimum, this suggests that even if the social rate of return to investment is as high as say 15 per cent, in the postulated conditions, it will be worthwhile to borrow only at effective rates of interest that are less than the lower social discount rate, say, of 6 per cent.[9]

If, however, the economy is faced by a complete savings bottle-neck (which means that in (1) above, $\gamma_0$ is zero), which is eliminated by the time the loan is repaid (which implies that by some date $t < T$, where $T$ is the date by which the inflow (loan) has been paid back, $\gamma_t = 1$), and irrespective of the constraints in foreign trading (that is the value of $s$) the appropriate cut-off effective rate of interest for foreign borrowing will be higher than the social rate of interest $d$, but for plausible values of the repayment period $T$, the social rate of return to investment $r$ and the social discount rate $d$, it will have to be lower than the *social rate of return to investment r*. This can be seen, if we assume, for simplicity, that in (1) $d$ and $s$ are constant, $\theta = 1, m = 1, g = 0, e = 0$, and $\gamma_0 = 0$, but $\gamma_t, \gamma_{t+1}, \ldots \gamma_T = 1$. Then from (1) (see Lal [16] for the derivation), the foreign capital inflow will be desirable as long as:

$$\frac{r_0}{d} \geq \left(\frac{1+i}{1+d}\right)^T \qquad (1\,b)$$

Thus for plausible values of the variables, say $T = 25$ years, $d = 5$ per cent and $r = 15$ per cent, the cut-off effective rate of interest, $i$, for which the loan is acceptable would be 9.7 per cent, which is less than the social rate of return to investment $r$ but greater than the social discount rate $d$.

Similarly, from (1) it can be shown (see Lal (1971)) that if, instead of the above assumptions, the economy is faced by a complete inelasticity of export earnings ($s_n \to \infty$), with a continuing constant divergence between the actual and optimum level of savings (that is, $d_n = d < r_n = r$), a capital inflow at any effective rate of interest is desirable as long as with time the country is able to change its foreign trade structure to enable some transformation through foreign trade (that is, $s_t < s_n$, where $t > n$). Finally, it can also be shown that if the capital inflow has no grant element and entirely supplements domestic consumption, it will still be socially desirable as long as the effective rate of interest $i$ on the borrowing is less than the social rate of discount $d$ and the Government is not faced by a savings constraint of any kind when the loan is repaid (that is, the Government can choose whatever value it likes for $\gamma_T$).

It should therefore be apparent that while any inflow at an effective interest rate below the social discount rate $d$ must be socially desirable whether it finances investment or consumption, inflows at even higher effective rates could be socially desirable under various circumstances, such as various structural features of the economy and expected changes in these over time. These features are normally taken into account in deriving shadow prices for project appraisal, and hence, in general, condition (1) can be interpreted as saying that valuing the net benefits from the

[9] Thus if the elasticity of social marginal utility is, say, 2, then the social discount rate will be twice the growth rate of consumption of the economy, in terms of a constant elasticity social utility function (see Lal [16]). A realistic value for the growth rate of consumption in many developing countries is 3 per cent per annum, which yields a value of 6 per cent for the social rate of discount.

capital inflow at shadow prices, the inflow is socially desirable if the discounted net present social value is positive, the discount rate being the social discount rate if the *numéraire* is aggregate consumption (*à la* UNIDO) or the accounting rate of interest (ARI) if the *numéraire* is savings (or more strictly uncommitted public income expressed in foreign exchange, *à la* LM).

To demonstrate that the cost-benefit framework is the appropriate one for evaluating foreign capital inflows, and that it can handle all the aspects that may be considered to have an impact on social welfare, an outline is given here of the ways in which a foreign capital inflow in the form of direct foreign investment can be handled, this time for fairness, within the LM framework.[10] (The following derivations are based on Lal [7], chapter II.7, where a more detailed discussion will be found.)

Consider the social evaluation of a direct foreign investment (DFI) project in a developing country, on LM lines (that is with uncommitted public income expressed in terms of foreign exchange as the *numéraire*).

The net social benefits (NSB) from the operation of the DFI in any year $n$ will be given by:

$$\text{NSB} = P_{xf}\, X - \sum_i a_i P_{if} - \sum_j h_j W_{sj} + E + K - \delta - v \qquad (2)$$

(The time subscripts $n$ have been suppressed since it is clear that all the terms in the above expressions are time-dependent.)

$P_f$ is the border price of the output (x) and the inputs (i),
$P_d$ is the domestic price of the output x and the inputs i,
$X$ is the quantity of the output,
$a_i$ is the quantity of the $i^{th}$ input, including plant and machinery,
$h_j$ is the quantity of the $j^{th}$ type of labour input,
$W_s$ is the shadow wage of the relevant type of labour,
$W$ is the actual wage of the relevant type of labour,
$E$ is the net external effect of the project,
$K$ is the capital inflow inclusive of retained earnings,
$\delta$ is the dividend and capital repatriated in foreign exchange,
$v$ is the foreign exchange value of the retained earnings of the foreign investment.

(It may also be noted that the border prices are all in terms of foreign exchange equivalent values on the LM lines, with those for non-traded goods being the marginal social costs of production of such goods in terms of foreign exchange.)

The first term on the left-hand side of equation (2) is the value of the output of the foreign investment at c.i.f. or f.o.b. prices; the second term is the value of all the intermediate inputs valued at c.i.f. and f.o.b. prices if traded goods, and at their appropriate LM shadow prices if non-traded goods; the third term is the cost of labour valued at the relevant shadow range for labour; the fourth term includes all the net external effects of the project such as the benefits from training labour which then leaves the foreign investor's firm before it has recouped training costs or the

[10] For a comparison of alternative project appraisal methods, see Lal [24].

costs imposed on other firms such as those of pollution, say, for which the foreign firm does not make any direct payment; the last three terms in the expression are self-explanatory.

If the time-stream of costs-benefits is properly behaved, we can then derive the internal rate of return (IRR), which will be the social rate of return of the project given by the solution to

$$\sum_{n=0}^{T} \mathrm{NSB}_n/(1+\mathrm{IRR})^n = 0$$

where $T$ is the terminal date of the project. This social rate of return can be compared with the LM accounting rate of interest (ARI) for the economy, and the project is socially profitable only if its social rate of return is equal to or greater than the ARI.

A useful transformation of (2) yields an expression which enables us to pinpoint the sources of the social benefits and costs to the host country from the operation of DFI. The last two terms in (2) represent the return to the foreign investor in year $n$ from the DFI, and hence it is a matter of definition that in any year $n$,

$$\delta + v = P_{xd}\, X - \sum_i a_i\, P_{id} - \sum_h h_j\, W_j - \rho - \tau \qquad (3)$$

where there are two new terms,

$\rho$ is the return (profit) to domestic capitalists if the DFI is a joint venture. This term will be 0 if the DFI is 100 per cent foreign owned,

$\tau$ is the sum of all the direct taxes levied on the foreigner.

The first term on the left-hand side of expression (3) is the value of the output of the foreign firm at the *market* prices at which it actually sells the goods; the second is the cost of its intermediate goods at the *market* prices it actually pays; the third is the *actual* payments for labour made by the foreign firm; the last two terms are self-explanatory.

Substituting (2) in (3),[11] we get

$$\mathrm{NSB} = (P_{xf} - P_{xd})\, X + \sum_i a_i\,(P_{id} - P_{if}) + \sum_j h_j\,(W_j - W_{sj}) + E + K + \rho + \tau \qquad (4)$$

The contribution of the last four terms to the social benefits from DFI is self-evident, since they provide the direct benefits to the host country from the DFI, namely, through the direct taxes levied on the foreigner ($\tau$), the return to domestic capital that may be associated with the POI ($\rho$),[12] the net capital inflow *(K)* and the net external effects of the DFI *(E)*. The first three terms of (4) represent the indirect costs and benefits associated with DFI. The third term, which gives the difference between the market and shadow wage bill, represents a net social benefit to the economy, since it represents an implicit indirect tax on the DFI on the labour it uses in the project. The first term represents the social cost-benefit from producing the

[11] In (1) the $W_S$ should now be interpreted as the shadow wage rate *exclusive* of distributional considerations, that is as representing only the social value of the output foregone elsewhere in the economy by using labour of type j on the DFI project.

[12] It should be noted that in the formulations of NSB, the return to domestic capital will contribute only to the desirability of financing the project from foreign rather than domestic resources for an identical outcome except for the form of financing, if the return to domestic capital is greater than the ARI. This can be checked by considering the case of a joint venture in which all the terms in (4) apart from $\rho$ are zero.

DFI product under a protective structure. Thus, if for example the output produced by the DFI is an import-substitute, $P_{xd}$ is the domestic price of the importable inclusive of any tariff. When an import substitute is produced by a DFI project, tariff revenue equal to the difference in the c.i.f. price of the importable $P_{xf}$ and the tariff inclusive price $P_{xd}$ is lost on each unit of the output produced, and this is a net social loss to the country. An equivalent argument applies to any export subsidy which is given to the output of the DFI project. Thus, as (4) correctly shows, if the border price of the output is *less* than the domestic price, then it will lead to social costs.

However, while such nominal protection of the output represents social losses, nominal protection of the inputs used by DFI represents a social benefit, as the second term in (4) shows. For if the DFI is forced to buy an import-substitute intermediate input at the domestic price $P_{id}$, which is above the import price $P_{if}$, the difference between the two prices represents the actual or implicit tariff, viz. monopoly profits accruing to domestic producers, and it is in either case equivalent to an indirect tax that the host country imposes on the DFI.

The combined effect of the tariffs on the outputs and inputs will therefore determine the net social cost benefit of the DFI, as represented by the first two terms. This combined effect of the protective structure on the inputs and outputs is usually represented in terms of the so-called effective protective rate (EPR) (see Cordon [25], which is defined as

$$(1+\text{EPR}) = V/V^* = (P_{xd}\,X - \sum_i a_i\,P_{id})/(P_{xf}\,X - \sum_i a_i\,P_{if}) \tag{5}$$

where $V/V^*$ is the value added at domestic (border) prices.

Substituting (5) in (4) yields

$$\text{NSB} = -\text{EPR}\;V^* + \sum_j h_j(W_j - W_{sj}) + E + K + \rho + \tau \tag{4 a}$$

which shows that increasing effective protection to DFI, *ceteris paribus,* reduces its net social value to the host country. Moreover, as can be seen from substituting (5) in (3), which yields the relationship of the private profitability of the DFI (NPB) to the foreign investor in terms of the EPR,

$$\text{NPB} = \delta + v = (1+\text{EPR})\;V^* - \sum_j h_j\,W_j - \rho - \tau \tag{3 a}$$

Thus, for the foreign investor, the profitability of the DFI project will be higher, *ceteris paribus,* the higher the effective protection provided.

Now, usually, the area in which most of the bargaining between host country Governments and foreign investors takes place is in the effective protection that is provided to the DFI. Typically, host country Governments either undertake to provide a protective tariff for the proposed DFI to induce foreign investment, or they maintain existing tariff barriers as an important inducement for foreign investors (see Lal [7] and Reuber [26]). The above analysis therefore suggests that DFI is likely to lead to social losses in the host country when it has come in or has been promoted in highly protected industries; this is borne out by a number of case studies conducted in Kenya and India (see Lal [7], parts III and IV) of the social rates of return to the host country from DFI in a number of industries. Thus, a useful calculation when appraising foreign investment is to calculate the degree of effective protection (EPR in the above formulae) which would reduce the net present value of the net social benefits accruing to the host country to zero, at the ARI, and the degree of effective protection which would make the private profitability to the foreign investor zero, at the expected foreign investor's rate of profit (which is likely

to be about 15 per cent (see Lal [7], part I). The former would give the maximum degree of effective protection compatible with the social profitability of the DFI project to the host country, while the latter would yield the minimum acceptable private profit to the foreign investor. The area of bargaining would then lie between these two limiting degrees of effective protection, and the host country should obviously try to approach the lower limit in the bargaining process.[13]

As normally the country is unlikely to negotiate the tariff rates or domestic prices of intermediate inputs in bargaining with the foreign investor, since these are likely to be determined by their effects on a whole host of other enterprises (such as domestic enterprises), the actual bargaining will involve the tariff protection offered to the output that the foreign investor is going to produce. In terms of the effect this has on the EPR, from (5), it can be seen that this means, that with the difference in value of the intermediate inputs at fixed domestic ($\sum_i a_i P_{id}$) and border ($\sum_i a_i P_{if}$) prices, that the bargaining will be about the divergence between the domestic ($P_{xd}$) and border ($P_{xf}$) price of the output. This difference is nothing else but the tariff on the output, which will be the primary focus of the bargaining. However, in some cases, in order to induce foreign investment, host country Governments also provide "subsidized" intermediate inputs (like electricity) at prices below their price to other users in the economy, or else below their social costs (shadow price). This means that the difference between the domestic and shadow price of intermediate outputs ($P_{id} - P_{if}$) will also be an area of bargaining. But, clearly, the bargaining about both the prices to be charged for intermediate inputs to the foreign investor, as well as the prices the foreign investor can charge for his output, will together determine the EPR offered to the foreign investor, and this from (4a) and (3a) will determine the social and private profitability of the foreign investment. The aim of the bargaining should thus, clearly, from the host country's viewpoint be to keep the effective protective rate offered as low as possible, by charging prices as high as it can for the inputs supplied to the foreign investor, and by seeking to obtain the lowest prices the foreign investor is allowed to charge for the domestic sale of his product.

Some other economic effects of DFI that will not be covered within this cost-benefit framework of appraisal have been suggested, but most of these are misconceived or else hard to quantify. Formally, in basic formula (2) for the NSB of DPI they will appear in the portmanteau E term, namely the externalities associated with the operation of the DFI. Among such indirect effects are: the effects of DFI on indigenous enterprise and deleterious external effects on host-country income distribution and consumption patterns. As regards the former, it is virtually impossible to quantify the effects on domestic entrepreneurship. In Kenya, in the study cited earlier, an attempt was made to examine to what extent the domestic alternative of fostering or encouraging indigenous entrepreneurship through the agencies of industrial estates was feasible. The conclusions were not encouraging, and hence it seems likely that very little that is useful can be said about the role of DFI in preventing the emergence of domestic entrepreneurship, given our present ignorance of the springs of such enterprise. As the case study in Kenya showed, in countries where there is a shortage of domestic entrepreneurs, it may not be possible to foster them through domestic public policy, and therefore, at least until their spontaneous emergence, reliance on foreign enterprise may be unavoidable. Moreover, even if it could be established that the presence of foreign enterprise lengthened the time-lag generally involved in the emergence of local entrepreneurs in these countries, as long as there would be such a time-lag even without the presence of the inhibiting

[13] For a fuller discussion of the problems in measuring the various variables appearing in (2), see parts I and II of Lal [7].

foreigners, it could seem desirable to maximize the relatively certain current gains from foreign enterprise rather than to wait for the uncertain future gains from the development of indigenous enterprise.

One way in which some judgement may be formed to answer the question whether the DFI has deleterious effects on domestic entrepreneurship and if it does, whether it would still be worthwhile to allow it in, would be to make the following estimate. Suppose that, if domestic entrepreneurs were available, the outcome of the project would be exactly the same as with DFI, except that now in the NSB calculation given by expression (2) there are no $E$, $K$, $\delta$ and $\nu$ terms. We then ask, how long can such a completely domestic alternative project be postponed to yield the same social rate of return as the DFI being examined? That is, if the NSB in any year from the DFI project is $\text{NSB}_n^f$, and the NSB from the completely domestic alternative is $\text{NSB}_n^d$, then we estimate $T'$ for which

$$\sum_{n=0}^{T} \text{NSB}_n^f/(1+\text{ARI})^n = \sum_{n=T'}^{T'+T} \text{NSB}_n^d/(1+\text{ARI})^n \qquad (6)$$

where ARI is the LM accounting rate of interest and $\text{NSB}_n^f$ is given by expression (2) (but with $E=0$), and with $\text{NSB}^d$, in any year (suppressing the time subscripts)

$$\text{NSB}^d = P_{xf}\, X - \sum_i a_i P_{if} - \sum_j h_j W_{sj}$$

The Government can then consider whether, in the absence of DFI, there is a strong likelihood that domestic entrepreneurship will arise and be able to undertake the currently proposed DFI project in less than $T'$ years. Obviously, if the answer is yes, the DFI should not be allowed because of its deleterious effects in inhibiting the undertaking of the same project by domestic entrepreneurs; while if the answer is no, the DFI should be allowed to go ahead since it will be providing net social benefits compared with a policy of waiting for the requisite domestic entrepreneurship to appear.

As regards the income distributional effects, it is well known that on the average DFI tends to pay wages to both skilled and unskilled workers and managers above comparable wages in domestic enterprises. This may lead to a distortion of income distribution within the country. However, as equation (4) shows, one of the important indirect taxes on DFI, and hence a source of benefit from its operation to the host country, is any excess of its payments to labour above their social opportunity cost. From this viewpoint the higher wages paid by DFI confer direct gains to the host country. The income distributional effects ideally should be taken into account by income taxation, but if this is unfeasible, then the Government could affect the distribution, in a second-best manner, through its choice of DFI projects, by weighting the distributional effects of projects and choosing those whose social profitability, taking account of distributional factors, is highest.[14] However, from the few case studies of DFI conducted in the study cited earlier, it was found that the distributional weighting made little difference to the social rates of return of the DFI projects. So the practical relevance of this factor may have been exaggerated in the past.

The discussion of the indirect effects of DFI which are said to be linked to its effects on domestic consumption patterns and on the quality of products it produces (see Stewart [27]) is simply misconceived. The argument is that DFI produces

[14] For a methodology for deriving these weights, see Little-Mirrlees [5] and Lal [7].

consumer goods for the rich since, given the existing pattern of income distribution in most developing countries, production of such goods is more privately profitable than production of the socially more desirable mass-consumption goods. It is argued further that the obvious remedy—a direct attack on the inequitable income distribution—is not politically feasible and hence, presumably as a second-best measure, the distribution of consumption should be made more equitable by the indirect means of controlling the relative supply of different types of consumer goods. This argument is schizoid. Firstly, it assumes that the rich who are politically powerful enough to prevent their incomes and hence their consumption from being cut by direct means would acquiesce in the same result being achieved through the back-door method of controlling the available supply of consumer goods they would like. Secondly, it assumes that a Government that is powerless to impose an effective income-redistribution programme is powerful enough to impose an effective production-control programme. Thus, it is unlikely that the rich can be prevented from consuming the goods they like as long as they remain rich, and the moot question then is, what is the way of providing this consumption with the lowest social cost? If DFI can provide these goods at lower social cost than a domestic alternative, clearly the DFI producing these goods is desirable.

As regards the quality of the goods produced by DFI, it is claimed that unnecessarily higher quality standards are maintained than are appropriate to satisfy the wants of consumers in developing countries and, implicitly therefore, that the resources embodied in maintaining the higher quality are a waste from the developing country's viewpoint. This argument is fallacious. If there are lower-cost substitutes available, with relatively high price elasticities of demand, and consumers in developing countries do not derive any additional satisfaction from the higher-quality characteristics of the more expensive product, firms maximizing profits will produce the lower-cost and cheaper substitute in the developing country. If consumers in developing countries too, however, prefer the higher-quality product to cheaper lower-quality substitutes, then it is not for us to say that they should really only prefer the cheaper lower-quality goods. Not surprisingly, this argument then quickly reverts to the earlier argument relating to income distribution, by which it is suggested that only the rich prefer the higher-quality goods and that if income distribution were more equal there would not be any demand for these goods. But, as we have noted above, this argument implies the use of direct means for altering the distribution of income and not the control of the relative supply of different consumer goods.

Finally, in discussing the evaluation of the economic effects of the operations of DFI, there is one aspect that forms part of the vertically integrated operations of an international firm, namely the problem of transfer pricing (Vaitsos [28]). The goods and services of such firms will not be exchanged as they are between its subsidiaries at "arms-length" prices. The prices in such inter-company transactions will tend to be determined by considerations of global-profit maximization, and hence the firm will tend to set the transfer prices to minimize its declared profits in high-tax areas to enable it to transfer them to low-tax areas. In such cases, especially if it is difficult or impossible to arrive at arms-length prices on any objective basis, it may be advisable for the host country to negotiate directly on the total tax to be paid by the foreign investor, based on physical output levels rather than on the conventional value of sales or profits. This is a lesson that will not seem novel to Middle Eastern countries which for a long time have known and used the instrument of posted prices for determining their share in the profits of oil companies.

Thus, it should be apparent that the cost-benefit framework is a useful and powerful one for determining the social profitability of foreign capital inflows into a

developing country. It pinpoints the sources of the net social benefits which may accrue from such inflows and hence the areas in which, if there is a range for the values of these net social gains, bargaining should be conducted. It also enables a country to discriminate between specific capital inflows, by determining their relative social profitability to itself. In our view, therefore, such appraisal of foreign capital inflows must be an integral part of any domestic machinery for controlling these inflows, since it alone can ensure that there are net social benefits to be derived from the operation of any particular inflow.

## III. Politics[15]

Despite the apparent, or potential, social benefits which both foreign aid and DFI can confer to developing countries, both, but particularly DFI, arouse fierce opposition in most developing countries. Most of this passionate resistance can be explained in terms of the disparity of power inherent in the current world system of nation States and by the fear that the relatively weaker powers have of coercion (direct or indirect) by the strong. Normally, in the conduct of diplomatic relations, each State evinces an external image, "it presents itself . . . as a corporate body whose authority cannot be questioned, whose decisions and internal processes are privileged, and whose actions in the external sphere are, within very broad limits indeed, unbound by law" (Vital [29], p. 94). This may be contrasted with the internal image of the State which reflects a well-understood relationship between the State and those who rule it. What the rulers of the host country fear most from the coercion made possible by foreign capital inflows is an attempt to subvert or weaken, through direct or indirect economic pressure, the internal hold of the rulers over their nationals. This threat of direct or indirect subversion is then seen as a means of pressuring the medium-sized or small powers to change a course or line of policy "which the national interest—or the interest of its leaders—would appear to require" (Vital [29], p. 5). The fear of vulnerability is thus an unavoidable by-product of the inherent differences in power among unequal States. However the fear is largely a state of mind among leaders of developing countries which, depending on the factors likely to be conducive to the success of politically motivated economic pressure, in many cases could bear no relationship to the objective situation these countries face. Even if the strong were to eschew the use of economic coercion as a tool of foreign policy, the fear of their *potential* for such coercion would none the less remain in the present world system.

Added to the fear of economic coercion are fears that dependence on foreign capital inflows, and in particular on DFI, will lead to a loss of sovereignty in national, fiscal, monetary exchange-rate and employment policies. Again, these fears need not necessarily be objectively based, and indeed it may be difficult (at least for an impartial outsider) to find them justified. For instance, while the leaders (or Government) of most countries, developed and developing, normally consider the flexibility of multinational companies in affecting national exchange rates through movements in short-term flow of funds as an intolerable infringement on their sovereign right to change such rates, nevertheless from an economic point of view and particularly from the viewpoint of their nationals, this supposed power to force changes in exchange rates on national Governments may in fact be beneficial. While this is not the place to go into deep problems of moral and political philosophy, considerations of this sort naturally arise. The author would like to point out that it

[15] A relatively more detailed treatment of the issues discussed in this section will be found in part V of Lal [7].

is not helpful to dismiss these fears as some authors have done (Kindleberger, ed. [30]) as being based on chauvinism or xenophobia, for that would be to assume a world-wide homogeneity of moral and political beliefs. The discussion here merely points out the complexity of the problem of appraising the validity of the political fears connected with foreign capital inflows, and the application in such appraisal of a set of parochial (explicit or implicit) value premises. As should be evident, many of these fears are subjective and depend on each country's image of itself and of others, as well as on its own goals and values and those attributed to others. Various forms of potential international action have been suggested for mitigating these fears (Vernon [31]), but as such fears are inherent in the present inequality of States, they are unlikely to be eliminated. Thus, in the world as it is, developing countries will have to live with their fears concerning foreign capital if they are to make use of this potentially important aid to their development. However, it is important for them to ascertain that there are positive social (economic) gains that would accrue to them from particular inflows; and to determine what they are, the cost-benefit framework outlined earlier in this article (and discussed at length with case studies in Lal [7]) remains indispensable.

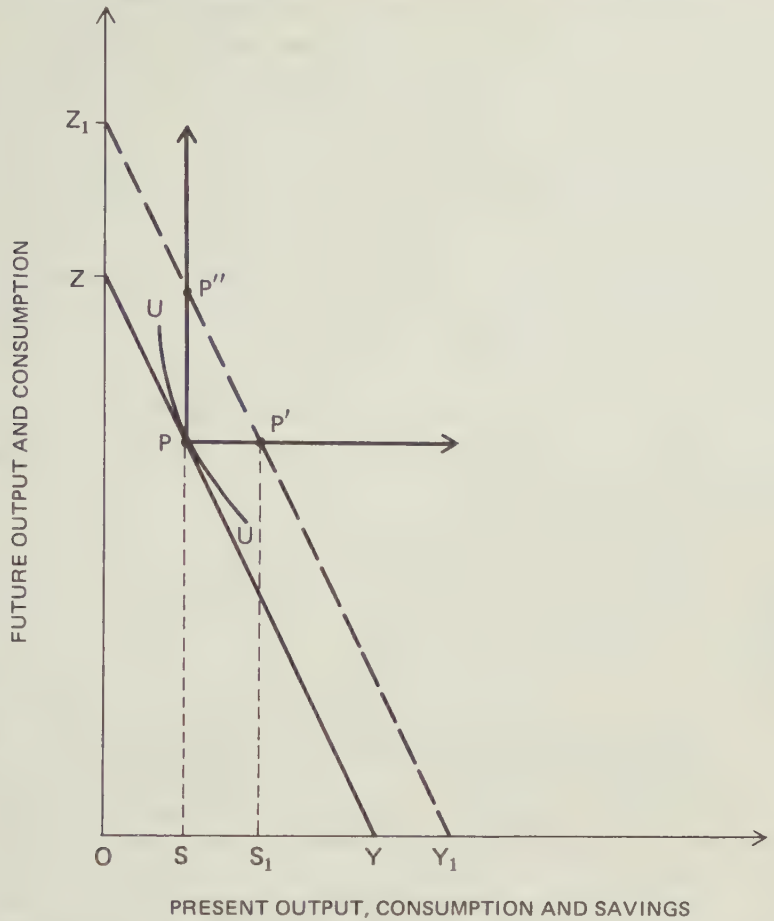
## *Appendix*

## *DOMESTIC SAVINGS, CAPITAL INFLOWS AND WELFARE*

Consider a two-period, one-good model, depicted in the figure, in which current consumption, savings and output are measured on the X axis, and output and consumption for the next period on the Y axis (there being no savings tomorrow since, *ex hypothesi,* the world then comes to an end). Suppose that current output OY can be converted into future output (and consumption) at a constant rate given by the slope of the straight line YZ. If UU is a set of social indifference curves reflecting social preferences for consumption today and tomorrow, in our model economy the optimal production and consumption point will be given by P, at which social welfare will be maximized given existing resources and the two-period production possibilities. At this optimum, YS of current output will be saved (and invested) to yield tomorrow's consumption, and the level of current consumption will be OS.

Now suppose that there is a capital inflow (in terms of grant equivalent) of $YY_1$. Assuming unchanged production possibilities (an assumption of convenience), the new optimum production-cum-consumption point will lie between $P'$ and $P''$ if both present and future consumption are normal "goods". Suppose the point lies at $P''$, then total savings (SI) will be YS after the inflow and equal to savings in the pre-inflow situation. Similarly domestic savings, as the portion of total savings (investment) from domestic sources (SII), will also be the same in the pre- and post-inflow situation and equal to YS. But what of domestic savings in the conventional definition? These are given by the difference between total investment and the aid inflow. In the pre-inflow situation, the former is YS and the latter zero, and hence domestic savings (SIII) are also YS. After the aid inflow, total investment at $P''$ is the same in the pre-inflow situation, namely YS, from which we subtract the aid inflow of $YY_1$ to obtain domestic savings (SIII) on the basis of the conventional definition as ($YS-YY_1$), which is necessarily less than SI = SII = YS.

Next, take the point $P'$. We have by a similar argument SI rising from YS to $Y_1S$, SII remaining constant at YS, and SIII remaining constant at YS. From this it follows that if both present and future consumption are normal "goods", while SI rises and SII remains constant, with a capital inflow, SIII must necessarily fall; SIII can only rise if the optimum production and consumption point in the post-inflow situation is to the right of $P'$, that is, if future consumption is an inferior "good".




Even then, as the graph shows, social welfare will have risen since the economy will be on a higher social indifference curve. However, if the transformation possibilities worsen as a result of the foreign aid inflow, then it is possible that the economy could be worse off with the inflow, a situation analagous to the case of immiserizing growth analysed in the international trade literature (see Bhagwati [32]). In terms of the figure this implies that the $Y_1 Z_1$ swerves to the left on $Y_1$, so that it is tangential to a lower social indifference curve in the post-inflow position compared to the pre-inflow position UU.

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# Book reviews

**Economics and World Order.** From the 1970's to the 1990's
Edited by Jagdish N. Bhagwati
New York, Macmillan, 1972, 365 pages

This collection of essays, sponsored by the World Law Fund, is addressed to an examination of the issues involved in devising an optimum economic order for the decade 1990-2000. Much of the work was carried out during the period 1959-1971 and has been discussed at several seminars.

The issues involved in reaching an optimum economic order in the last decade of this century are considered in global, conceptual, institutional, regional and national contexts. An introductory article by the editor sums up the key issues arising from the papers and the discussions. This is followed by two essays on global perspectives, two on socialist prognoses, four on institutional arrangements, regional studies on Latin America and Africa and country studies on China and India.

While recognizing that the prospects of closing the gap between the rich and poor nations by 2000 A.D. are extremely dim, the editor, Bhagwati, makes, on the whole, an optimistic prognosis on the basis of anticipated policy changes, e.g. he considers an aid flow level of 5 to 10 per cent of the GNP from the rich nations as conceivable. He advocates a target to achieve a minimum income rather than to eliminate the gap, which would require concentration on eradicating the worst poverty first. The author rules out the notion of a world famine by 2000. He puts considerable emphasis on policy issues relating to transfer of resources: official capital, skilled manpower and the like and on self-help policies of the developing countries with the goals of growth and income distribution. He feels further that "the world will tend to gravitate towards a position of near-free trade, the major departures from it being the continued agricultural protectionism in the developed countries and the continued industrial protectionism in the developing countries, each vis-à-vis primarily the other bloc".

The editor's forecast of GNP is as follows:

**GNP estimates**
(Billion 1965 US dollars)

| | *1965* | *2000* |
|---|---|---|
| Less developed world | 326.1 | 1 807.1 |
| Developed world | 1 790.7 | 9 041.0 |
| World total | 2 116.8 | 10 848.1 |

Thus, it is estimated that the share of developing countries in the world GNP in the year 2000 will be 16.6 per cent, as against 15 per cent in 1965.

P. Rosenstein-Rodan is rather more optimistic than Bhagwati regarding the narrowing of the gap between rich and poor nations by 2000 A.D. His prediction is that the growth rate of more developed countries will go down, since they will demand more leisure than real income. On the other hand, with improved education, better knowledge of technology and economic policy, better infrastructure etc., the growth rate of developing countries would increase. He thus forecasts that the share

of the developing countries in world GNP would increase from 15.3 per cent in 1965 to 18.3 per cent in 2000.

The main thesis of Thomas E. Weisskopf is that "the spread of capitalism throughout the underdeveloped world is likely to perpetuate rather than to alleviate the conditions of underdevelopment". Thus Weisskopf is on the whole pessimistic.

Jozef Pajestka forcasts that, while the gap will grow wider between developed countries and developing countries which have adopted the capitalist way, the socialist countries will have a faster rate of growth enabling them to bridge the gap. He points out that over the period 1950-1967 the annual rate of growth in per capita product was 6.7 per cent in the socialist countries of Europe, as against 3 per cent in the developed countries and 2.2 per cent in the non-socialist developing countries. Thus his conclusion is that the socialist way is the most desirable for the developing countries.

Lev. V. Stepanov, while considering the possibility of a widening gap, adopts a philosophical view as to implications for world political stability and security. His conclusion might be summed up as follows: "One may venture a prediction that all of these phenomena combined will culminate in a situation where present world economic competition, as it exists between capitalism and socialism, will to a considerable extent be transformed into a rather different form of competition, where values other than economic values will be involved; and these values will increasingly become the values of participation, values which are related to the problem of alienation, values relating to what might be described as the meaningfulness of human life."

Stephen Hymer analyses the implications of the multinational corporation and concludes that "it will demonstrate the possibilities of material progress at a faster rate than it can realize them, and will create a worldwide demand for change that it cannot satisfy". While recognizing the need for an alternative, Hymer does not offer one.

Jan Tinbergen prefers the method of planning to the method of forecasting. He advocates redistribution through transfer from the rich to poor nations, freer migration of labour and structural world changes including the concept of a world government.

Two articles on world trading and monetary arrangements, by Harry G. Johnson and Robert Triffin, do not obviously take into account the developments since 1971. For the long term Triffin advocates centralization of money creation itself and the adoption of a single circulating–as well as reserve–currency for the world as a whole.

The first article on Latin America by Osvaldo Sunkel leads from an historical interpretation into a description of structural deficiencies and an advocacy of new development strategies directed away from import substitution and "branch plant economy" to a transformation of the internal structure of production, including attention to capital-intensive technology, integration of markets and employment-augmenting and income-redistributing strategies.

The second article on Latin America advocates the same approach but takes into account the limitations of integration and the possibilities of growth being served by relatively modest and undramatic investments spread throughout the region. It is forecast that per capita gross product for the 19 countries would increase from $497 in 1970 to $957 in 2000 (at 1960 prices).

The article on Africa by Dharam P. Ghai contains a sketch of economic goals for the next three decades. It is stated that African countries should aim at an overall economic growth of 6 per cent in the 1970s, 6.5 per cent in the 1980s and 7 per cent in the 1990s. On this basis, the total African product at constant prices is estimated at $276 billion and the per capita income at $375 by the end of this century.

Separate growth rates for agriculture, mining and manufacture are provided. Policy implications to achieve these goals are analysed, including the need for regional co-operation, income distribution, institutions and ideologies and a strategy for development.

The second article on Africa, by Ali A. Mazrui, concentrates on the theme of modernization and reform, including techniques and processes, motivational patterns and stratification.

The article on China by Shigeru Ishikawa analyses economic trends and development and presents projections up to the year 1995, based on three different sets of assumptions.

The article on India by Pitambar Pant provides highly unrealistic projections, based on an average growth rate of 7 per cent; e.g. the share of manufacturing in the net domestic product will increase from 26 per cent in 1980-1981 to 42 per cent in 2000 A.D. The net domestic product from mining, manufacturing and construction, it is estimated, will increase from Rs 50 billion in 1967/68 to Rs 150 billion in 1980/81, Rs 410 billion in 1990 and Rs 950 billion in 2000 A.D.

On the whole, the book contains a rich collection of essays and studies on an optimum world economic order to be attempted for 2000 A.D. and provides analyses and references relevant to the work of UNIDO, even though there are no detailed analyses of the manufacturing sector, possibilities of redeployment of production capacities etc. Some studies might be regarded as idealistic or Utopian, despite the underlying recognition of the realities and practical possibilities. One lesson that might be learned from the experience of successful development is the importance of self-reliant strategies (including internal structural changes and redistribution policies) over dependence on foreign aid and integration with developed economies, although the latter does help in the short term.

S. NANJUNDAN

**French Economic Growth**
by J.-J. Carré, P. Dubois and E. Malinvaud
Stanford, California, Stanford University Press, 1976, 568 pages

First published in French in 1972, this book is one of a group of studies on economic growth in seven developed countries. It is predominantly empirical in approach. The authors analyse physical sources of growth and then turn to a search for the causes of the French growth experience.

At the outset, the authors emphasize that their study does not provide "a monistic thesis on the cause of present-day growth, but rather a number of partial explanations that complement one another". Such an approach is a welcome addition to the literature on this subject which, in the past, has tended to concentrate on issues that were highly abstract and that inhibited empirical study. Clearly, the analytical method employed by the authors is weighted against any "grand synthesis" or single explanation for economic growth since it divides up reality and examines each of its aspects in turn. The weakness of general theories in explaining the growth process have become more evident in the light of the experience of the developed countries in the 1970s with stagflation.

The historical starting point for the study is the year 1896. The more recent period of 1949-1969 is of particular interest, however. Although the rates of growth achieved in this period were not exceptionally high, the fact that steady growth was maintained over such an extended period is unique among the industrialized countries.

The authors examine a number of physical sources of growth including human resources, labour productivity, investment, capital growth, the industrial structure, total factor productivity and technological progress. In each field the contribution to the growth process is analysed in the long term and in the post-war period. The significance of the contribution of each of these fields to French economic growth varied during the period studied. It is clear, however, that gains in French productivity have been noteworthy, particularly since 1949. Underlying physical factors suggest that this has resulted from a complex interaction, attributable partly to a high investment effort, partly to structural changes and partly to technological progress.

From an analysis of physical sources of growth, the authors turn to a search for potential causes. Among other subjects they consider are aggregate demand, investment and savings, finance, market structure and national planning. Each factor has played a significant causal role at some point, although the task of isolating the effects has proved very difficult in some instances. As in the case of the contribution of physical growth sources, the authors' study leads them to reject an explanation giving primary credit to one causal force. They do, however, distinguish between two groups of factors favouring growth in the post-war period—those forces attributable to the country's own efforts and those external to the economy and independent of its actions.

Among the causes for domestic growth, three are thought to be particularly significant. The first is education. Development of primary, and, later, secondary and higher education has led since the beginning of the century to continued improvement in worker qualifications. This better-educated population was used ineffectively until after the end of the Second World War when it was engaged increasingly in modern activities. The second cause is the development of "industries with a future". During the first half of the twentieth century these were essentially industries producing capital goods. Though the depression and the Second World War disrupted real growth in key sectors, research and development continued. Following the war, new techniques were available for rapid expansion. Significantly, the proportion of foreign capital goods fell steadily with each investment boom between 1900 and 1963, despite the liberalization of foreign trade. Finally, substantial potential demand, left behind by the depression and the war, played a positive role in stimulating growth. Reconstruction needs, followed by growth in public consumption and, lastly, industrial requirements and exports served to fuel aggregate demand.

In addition to these national circumstances the authors add that the international environment was extremely favourable to French growth. The post-war co-operation and financial assistance provided by the United States was an important stimulus in reawakening the French economy. The knowledge acquired by French industrialists concerning new techniques of production and organization was a key element of this co-operation—probably more important than the actual financial assistance. Similarly, frequent contact with the country's European neighbours, where labour productivity was already growing at a rapid pace, suggested numerous opportunities to French management. Lest the reader jump to the conclusion that growth performance in the period 1949-1969 can be largely explained by a "catching-up" process following the wartime disruption, the authors stress the

long-term characteristics of the salient growth causes and make the distinction between the French growth process and that of other European economies in the same period.

In such an authoritative and otherwise elaborate study, one may have hoped for a discussion of some of the benefits and social consequences of economic growth. Unfortunately, this is not the case. The authors raise such questions in the closing paragraph of the book but regard them as subjects for subsequent study. The reader who attaches a high priority to the relationship between growth and income distribution, the quality of life and the benefits of growth will be somewhat disappointed.

R. H. BALLANCE

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